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THE GIFT OF
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PUBLIC DOCUMENTS

OF THE

STATE OF WISCONSIN

BEING THE REPORTS OF THE VARIOUS

State Officers, Departments and Institutions,

For the Fiscal Term ending June 30, 1908.

VOLUME 3

MADISON
DEMOCRAT PRINTING COMPANY, STATE PRINTER
1910

PUBLIC DOCUMENTS

For 1907-1908.

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THE UNIVERSITY OF WISCONSIN

BIENNIAL REPORT

OF THE

BOARD OF REGENTS

FOR THE

Years 1906-7 and 1907-8

MADISON
Democrat Printing Company, State Printer
1908

THE REGENTS OF THE UNIVERSITY

The Regents

The President of the University, *Ex-officio.*
C. P. Cary, State Superintendent, *Ex-officio.*
State-at-Large, Magnus Swenson, Madison.
State-at-Large, W. D. Hoard, Ft. Atkinson.
First District, Pliny Norcross, Janesville.
Second District, Lucien S. Hanks, Madison.
Third District, Enos Ll. Jones, Hillside.
Fourth District, Fred C. Thwaits, Milwaukee.
Fifth District, James F. Trottman, Milwaukee.
Sixth District, D. P. Lamoreaux, Beaver Dam.
Seventh District, Edward Evans, La Crosse.
Eighth District, Mrs. Florence G. Buckstaff, Oshkosh.
Ninth District, Gustave Keller, Appleton.
Tenth District, George F. Merrill, Ashland.
Eleventh District, A. P. Nelson, Grantsburg.

Officers of the Regents

W. D. Hoard, *President.*
L. S. Hanks, *Vice-President.*
A. H. Dahl, State Treasurer, *Ex-officio Treasurer.*
M. E. McCaffrey, *Secretary.*
L. J. Pickarts, *Bursar.*
E. Fewson, *Purchasing Agent.*

Standing Committees

(The president of the university is ex-officio a member of all standing committees.)

Executive—Swenson, Hanks, Norcross.
College of Letters and Science—Merrill, Lamoreaux, Cary, Evans, Buckstaff, Thwaits.
College of Agriculture—Hoard, Jones, Norcross, Merrill, Nelson.
College of Law—Merrill, Norcross, Trottman.
Trust Funds and Donations—Hanks, Lamoreaux, Nelson.
Finances—Hanks, Swenson, Merrill, Nelson, Norcross.
College of Engineering—Swenson, Keller, Thwaits, Lamoreaux, Nelson.
College of Medicine—Evans, Trottman, Keller.
University Extension—Cary, Buckstaff, Lamoreaux, Trottman.
Athletics—Nelson, Thwaits, Van Hise.
Deanship of Women and Chadbourne Hall—Buckstaff, Merrill, Van Hise.
Publications (Aid)—Keller, Jones, Van Hise.

The University of Wisconsin

REPORT OF THE REGENTS

FORT ATKINSON, WIS., Nov. 12, 1908.

TO HIS EXCELLENCY, JAMES O. DAVIDSON,
Governor.

SIR:—In behalf of the regents of the university, I have the honor to present to you herewith their biennial report for the years 1906–7, 1907–8.

This contains the reports of the president of the university, the deans of the colleges, the directors of the various courses and schools and other officers, the reports of the visiting committees, of the treasurer, and of the secretary.

I shall not attempt in this letter of transmittal to summarize these various reports. All together they show very clearly the progress of the university during the biennial period, and in detail all financial transactions.

At the end of the previous biennial period, June 30, 1906, the balance in the treasury was $26,594.97. At the end of the biennial period, June 30, 1908, the balance is $99,974.86. Thus there is a gain in the balance during the two years amounting to $73,379.89. The handling of the finances so as to increase the balance, has been in response to the frequently expressed desire that as rapidly as possible a sufficient balance be accumulated so that it will not be necessary to continue the privilege of transferring from the general fund to the university in anticipation of the payment of two-sevenths of a mill tax.

The growth of the university during the biennial period has been very rapid. The students have greatly increased in number. The work has been improved in its efficiency. New lines of work for which there have been strong demands have been inaugurated. Of these some of the more important are the course for the training of teachers, the establishment of the college of medicine, the introduction of the two year practical course in agriculture, and the establishment upon a very broad basis of university extension. Through the many lines of extension work in the university, including that in liberal arts, in engineering, and in agriculture, many thousands of the people of the state, who have not been able to attend the university, have been reached.

The reports of the educational officers show how important have been the services of the university to the state in the way of instruction at the university, in instruction outside of the university, and in investigations of the problems of the state, agricultural, engineering, political, social, etc.

The university so far as its funds will permit has taken advantage of the opportunities for upbuilding the state in every way, but the opportunities for service in this direction are still far beyond our resources. Therefore the educational officers in their reports have placed before you the pressing needs of the university, which are very large. If their requests for additional resources are granted by the legislature, it is my belief that in the future, as in the past, the results will more than justify the additional grants.

Bespeaking for the university a liberal treatment by the legislature, commensurate with its great opportunities to serve the state, I am,

Very respectfully yours,

WILLIAM D. HOARD,
President.

REPORT OF THE PRESIDENT

For the Years 1906-7 and 1907-8

To the Honorable W. D. Hoard,
President of the Regents of the
University of Wisconsin.

Sir:—Herewith I submit my report for the biennial period ending June 30, 1908.

The report consists of the following parts:

I—The Progress of the University.
II—The Needs of the University.

My report is supplemented by the reports of the deans of the colleges, the directors of the various courses and of the graduate school, and the reports of other officers.

PART I.—THE PROGRESS OF THE UNIVERSITY.

CHANGES IN THE FACULTY.

The many changes that have taken place in the faculty during the past two years will not be summarized by me, since this information is contained in the reports of the deans and directors, and is shown by the table at the end of the report.

As reported by the dean of the college of engineering, the oldest member of that faculty, Professor Storm Bull, died November 17, 1907. Professor Bull, throughout his long service to the university, became known for the absolute fidelity with which he performed the duties assigned to him. He had gained the affection and respect of the faculty, and was much beloved by the students who studied under him. We gladly recognize his long and faithful service to the university.

June 30, 1908, ends the third year in which the two-sevenths of a mill tax has been available for the support of the university, and therefore the third year in which the process of strengthening the faculty has continued. The increase in the faculty for the biennial period is shown by the table below:

	1905–6.	1907–8.
Professors	78	85
Associate professors	9	13
Assistant professors	45	59
	132	157
Instructors	113	119
Total	245	276

The assistants are not included in the above, since there is no exact way in which to compare the assistants for any one year with those of another. An assistant does a variable amount of instructional work, ranging from perhaps one class, or assisting in one laboratory course, to giving a half or more of his time.

From the above table it appears that the increase in the number of professors, associate professors, and assistant professors during the two years has been twenty-five; whereas the increase in the number of instructors has been only six. Therefore there has been a marked improvement in the grade of the instructional force.

It has sometimes been claimed for the small college, in contrast with the university, that the student at once comes in contact with the professor; but it should be remarked that this claim is often specious, since the instructors in the university are usually men who have done three years of advance work beyond their A. B. degree, have received their doctorates, and when called to a college almost invariably are given the rank of full professor.

INCREASE IN STUDENTS.

The increase in students which has continued for so many years has persisted during the biennial period. The total attendance for the year 1905–6 was 3,571, for the year 1906–7, 3,659, for the year 1907–8, 4,013. Thus the increase for the first year of the biennial period was 88, for the second year, 354, and for the two years, 442.

From the above figures it appears that the percentage of increase in the number of professors, assistant professors, and instructors for the biennial period was 12.6 per cent, whereas the percentage of increase in the number of students during the biennium was 12.4 per cent, that is, the increases were about proportional, as they should be.

INCREASE IN EQUIPMENT.

The legislature of 1907 extended the permanent educational improvement fund of $200,000 per annum from three years to five years, so that during the biennial period this fund has been available, and has been used for new buildings, for improvements on old buildings, for apparatus, and for books.

Buildings.—The agronomy and agricultural engineering buildings, begun in the previous biennial period, have been completed. They have greatly increased the efficiency of these two departments.

The north wing of university hall has been finished. The completion of this wing has furnished very greatly needed lecture rooms and offices for the branches of the college of liberal arts other than science.

The hydraulics laboratory of the college of engineering has been completed, and furnishes adequate facilities for the important subject of hydraulics.

The corner facing on Park and State streets, having upon it a stone building, has been purchased. To this building an addition has been made, so that it very well serves the needs of the regents as an administration building.

The new central heating station, while not finished at the end of the biennial period, is so advanced in its construction that it is expected it will be available for use during the college year 1908–9. The site for this station is adjacent to a railroad just off of the university campus proper, and in such a position that the buildings may be easily reached by tunnels or conduits. The boilers are of the most modern type, and are fitted with mechanical stokers. There are large coal bins above the boilers. The coal and ashes are to be handled mechanically. While at present the building is provided with boilers only to the extent of 1,750 horse power, there is room to increase this to 4,200 horse power, and the stack is large enough to carry 8,000 horse power. The station is designed to be a model of economic handling and burning of fuel. Besides being efficient in heating the buildings, it will serve for educational purposes to the college of engineering. Although the building is constructed to house the boilers, coalbins, and necessary machinery, its exterior is so pleasing that there has been very favorable comment upon its architecture.

Apparatus and Books.—The $200,000 per annum permanent improvement fund has been expended largely for the above buildings, but also from this fund the necessary permanent repairs and improvements, the books for the general library, and the engineering apparatus have been paid for.

THE COLLEGE OF LETTERS AND SCIENCE.

Improvement in Organization.—The rapid increase in the number of students in the college of letters and science, from 1,579 in 1905–6 to 1,762 in 1907–8, has made it necessary for the educational officers to continue to study the problem of its organization. Several departments have as many as five hundred students, and at least four, about one thousand. Such departments almost become small colleges. It has been the fear of some men that instruction to the individual students will become less efficient in the large departments as compared with the smaller ones, and thus it has sometimes been held as a theoretical idea that instruction in the elementary courses is better in the small colleges than in the university. Our experience has shown that the large departments are capable of being organized so that each student shall have as efficient, or more efficient instruction, than when the departments were smaller. As the students have increased in number, the instructional force has also been increased, so that the divisions in the systematic drill work, such as languages and mathematics, average only about twenty-five.

As pointed out by the dean of the college, the class room work of the sections is supplemented by regular conferences between the members of the teaching staff of the department and the students. Until the present biennial period this last development was not possible, because of lack of office rooms for the instructional force in the humanities, and because no undergraduate seminary rooms were available. The enlargement of the space for the humanities and mathematics, by the addition of the north wing of university hall, has remedied this defect, and thus there has been much development during the biennial period in this direction.

New Courses in Chemistry and Training for Teachers.—Not only has there been improvement in the efficiency of the organization within each of the departments, but there has been development in grouping the work of the various departments to a definite end. Thus there have been established in the college of letters and science, during the past two years, the course in chemistry and the course for the training of teachers.

The course in chemistry was formulated in the second year of the biennial period. Its aim is to prepare men for professional work in chemistry, exactly as the course in civil engineering prepares for professional work on railroads. While it is going beyond this biennium it may be remarked that the registration in this course in the autumn of 1908, the first year it is in operation, is thirty-nine.

But perhaps the most important development of organization during the year is the course for the training of teachers for the secondary schools. This subject has been most earnestly studied by the faculty of the college of letters and science during the entire period. This is but a continuation of the study of the problem which has been going on for a number of years. A committee upon the training of teachers has been established by the faculty. Departmental teachers' courses have been introduced into the various departments. Cooperation has been entered into with the Madison high and elementary schools for observation and practice work. The work of the department of education has been extended. We now feel that the solution of the problem of the training of teachers for the secondary schools has been made, although to carry out this solution will require important additional steps which are later mentioned in connection with the needs of the university, and are fully discussed in reports by Dean Birge and by Professor E. C. Elliott, chairman of the committee upon the training of teachers.

As yet the demand upon the university for teachers has exceeded the supply. The new course for the training of teachers will undoubtedly increase the number available for teaching in the secondary schools. To still further increase the number, the regents of the university have formally proposed to the normal school regents, that a combined four year course for the training of teachers for the secondary schools be introduced, leading to the A. B. degree. As yet this proposal is under advisement by the normal school authorities. The proposal on the part of the university is as follows: That a joint committee of the educational officers of the normal schools and of the university meet and work out a four year course, the first two years of which shall be given in the normal schools and the second two in the university, such course to be submitted to the regents of the university and the normal schools for approval. It is believed that if this proposal be accepted, any shortage of adequately trained teachers for the secondary schools will be met within a few years, with the maximum of efficiency and the minimum of expense.

There is a practically unanimous consensus of opinion among educators, with the possible exception of a number of normal school presidents, that four years of work beyond the high school is the minimum training which should be accepted for teaching in the secondary schools, and it is believed by many that, in addition to these four years, a half year or a year of graduate work should be required. It is our own view that while this additional work cannot now be required, it is extremely desirable, and therefore in the university course for the preparation of teachers, we have introduced a half year of graduate work. In California already the equivalent of a full year of graduate work is required. We cannot believe that for any length of time the state of Wisconsin will be content to accept for teachers in the secondary schools less training than is demanded by the most progressive states in the country, and if this be so, it is certain that the minimum required for this work will be a four year course.

It therefore seems to us that in the development of a strong four year course in the university for the training of teachers, in cooperation with the normal schools in a four year course one half of which is to be in the normal school and one half in the university, and in provision for graduate work, we have potentially solved the problem of the efficient training of an adequate number of teachers for the secondary schools.

The School of Music.—In the school of music, Professor F. A. Parker, so long director, has been made emeritus professor. A new director, R. G. Cole, has been appointed. The first steps have been taken to reorganize the school. With two or three exceptions the salary of the staff in this school has been upon the fee plan. An additional member of the staff has been engaged for the coming year on a salary basis. The number of hours of instructional work per week which may be done by those working upon the fee plan has been limited. It is the desire of the regents, as soon as possible, to place all the staff on a definite salary, and to put the school of music upon a strictly university basis.

THE COLLEGE OF MEDICINE.

For many years a pre-medical course has been developing in the university. The first subject introduced looking toward medicine was bacteriology, established as a part of the department of biology. Similarly, there grew up in connection with this department, the subject of human anatomy. There was, however, no authority to establish a college of medicine. This authority was granted by the legislature of 1907. In accordance with this authorization, there were established during the biennal period the departments of physiology and physiological chemistry. Also, the departments of pathology, pharmacology, and toxicology were authorized during the biennial period, and will be in operation during the year 1908–9. Thus, beginning that year there will be in the university the full first two years of a four year medical course. This work has been organized in the college of medicine and Dr. C. R. Bardeen has been elected dean. The hygienic laboratory, formerly in the charge of Dr. Russell, the coming year will be in charge of Dr. M. P. Ravenel, professor of bacteriology; this transfer being made because of the fact that Dr. Russell has taken the deanship of the college of agriculture. It is the plan to have the hygienic laboratory work in close cooperation with the medical departments.

Since there are no adequate facilities for clinical work, it is not expected that in the immediate future the third and fourth years of the medical course will be added, so that for the present we shall have at the university only one-half of the four year medical course.

The medical college of the university has already been recognized by the American Medical association, by the other medical colleges of the country, and by state boards, so that students doing medical work in the university will receive full credit for the same when they transfer to the other medical colleges for their clinical work. It is believed that there are many advantages to the students in doing the scientific work of the medical course in a university in which the medical departments are closely associated with the scientific departments of the college of letters and science.

The faculty of the college of letters and science have agreed to the principle that students, candidates for the degree of A. B., may register in the medical college for one year of the course, and those who are candidates for the degree of B. S., may register for two years of the course. Thus it is possible for students who are taking the bachelor of science course at the end of their four years' work to have done two years toward their medical course, and those who desire the degree of bachelor of arts to have done one year. Under this arrangement, the bachelor degree as well as the medical degree may be obtained in six and seven years after graduating from the high school.

Besides doing instructional work the professors in the medical college are taking up vigorously investigational work, are assisting the physicians of the state through the hygienic laboratory, and, by cooperation with the extension division, are carrying out to the people knowledge of sanitation and hygiene. It is believed that the advancement of preventive medicine in the state will gain immeasurably from the establishment of the first two years of the medical course.

The details of the organization of the college of medicine, and the work of the various departments, are given on subsequent pages in the report of Dean Bardeen.

THE COLLEGE OF AGRICULTURE.

Retirement of Dean Henry and Election of Dean Russell.— The most notable change in the college of agriculture during the biennial period is the resignation of W. A. Henry, as dean of the college and director of the station, and the election of H. L. Russell, formerly professor of bacteriology, to fill this place.

When, as professor of botany, Dean Henry came here more than twenty-five years ago, agriculture was a small department. It was organized as a college in 1889. The growth of the college and its influence in the state from the small beginnings of those years to its present importance are more largely due to Dean Henry than to any other one man. The university and the state owe Dean Henry a great debt of gratitude for the ability and untiring energy which he devoted to the agricultural interests of the state. Indeed, Dean Henry was so unsparing in his drafts upon his vitality that two or three years ago he found he was unable longer to carry the administrative work of the dean, although comparatively young in years. From time to time he asked to be relieved from the duties of dean, but he was urged to continue with the hope that his health would improve. However, in the first year of the biennial period it became plain that he could no longer shoulder the burden of the deanship, and his resignation was with great regret presented to the regents and was regretfully accepted by them.

Following the policy which has prevailed within the institution of promoting a man in the ranks to a higher position in case there be a man fitted for the task, H. L. Russell, professor of bacteriology, was asked to take the deanship. He consented to have his name presented to the board, and was elected dean April 17, 1907, to take effect July 1, 1907. He therefore has served as dean of the college of agriculture and director of the experiment station one year of the biennial period, and already has shown his eminent fitness for the place.

Changes in Courses.—During the biennial period the four year long course has been remodelled. A new middle course has been introduced, two years in length, the subjects of which are mainly of a practical character, to meet the needs of the men who desire a fuller training in agriculture than is furnished by the short course, and who do not desire to take the full four year course and receive a degree.

Research Work.—During the biennium the researches of the experiment station have been very fruitful indeed. The results of a number of lines of investigation have come to a head and several new lines undertaken. Since this work is fully summarized in the report of the dean of the college it need not be further considered here.

Extension Work.—During the past two years the extension work of the college has been very considerably enlarged. The ten days farmers' course at Madison has continued to grow rapidly in numbers. At two of the county agricultural schools similar farmers' courses of several days' duration have been carried on. The demonstration work in the state has been continued and enlarged, including potato spraying, orchard spraying, tuberculosis post mortem demonstrations, and the work of the demonstration farms.

Perhaps the most important single step made in the extension work during the biennial period has been that of the children's corn contests at the county fairs. This year, in twenty-six county fairs, the children exhibited corn grown from the high-bred seed furnished by the experiment station. In the case of the Dane County fair there were eight hundred contestants for the prizes. The influence that such educational work among the children of the state will have upon the future of agriculture cannot be estimated.

THE COLLEGE OF ENGINEERING.

The increase in students in the college of engineering during the biennial period is the largest in the history of the college, from 768 to 921, a growth of 153.

The most important developments of the college are the introduction of an advanced course of study, the completion of the mining engineering course, and the development of research work.

Advanced Course.—A quarter of a century ago technical education was very weak within the United States. The demand for better technical training led to the establishment and rapid development of the technical college. These colleges have been wonderfully successful throughout the country. However, it is now being appreciated by those interested in engineering education that the technical school is apt to become too narrow, providing excellent training along the technical lines, but not giving sufficient breadth of training. It is my belief that before many years we shall require for engineering training two years' work in liberal arts. I hope that we may be the first institution in the west to introduce such a requirement, as we were the first in the west to require two years of liberal arts for the college of law, greatly to the advantage of that school. At the present time it scarcely seems practicable to make as an absolute requirement work in the college of liberal arts before entering the college of engineering, but the first step has been made in this direction. An advanced five year course in engineering has been introduced, the first year of which shall be liberal arts. This course was formulated in the second year of the biennial period, and already in the autumn of 1908–9 there are registered in the engineering part of this course twenty-eight students.

Mining Engineering.—As indicated in my previous biennial report, the course in mining engineering, called the pre-mining engineering course, had been sufficiently developed so that it needed the addition of one man only to complete the course. This was authorized and there has been secured as professor of mining engineering, Mr. E. C. Holden, so that for the coming fiscal year, there will be a complete mining course in the university.

Graduate and Research Work.—Another very important development within the college has been the growth of the graduate instruction and research work. Until the biennial period upon which I am reporting, there never had been available for the college of engineering a definite fund for investigation. For the biennial period there was annually appropriated for this work $4,500. This money has been most effectively used to carry on a number of investigations of very great importance to the state, the results of which have been published in a series of bulletins given in detail in the report of the dean of the college. In addition to these a large number of investigations have been made, the results of which are not yet published.

The addition of research work to the college of engineering as an integral part of the work of the college, just as research is recognized as an integral part of the work of the college of agriculture, has led to the development of graduate instruction in the college. Until this biennial period the graduate students in engineering were only occasional. There is now a persistent group of graduate students in engineering, for the year 1907–8, fifteen. It is believed that this higher grade instruction in the college is likely to expand rapidly.

THE COLLEGE OF LAW.

The second year of the biennial period, the requirement went into effect of two years in the college of liberal arts, or its equivalent, before admission to the law school. It was feared that the result of requiring first one year, and then two years of the work of the college of liberal arts would be to considerably reduce the number of students. Such has not been the fact, although there has been a slight falling off. The attendance at the law school for 1906–7 was 165, eleven more than in 1905–6. In 1907–8, the first year in which the full two years requirement was put in force, the number was 157, that is, the school has just about maintained itself in numbers during the transition to a higher standard.

Now that we are past the crucial period of the introduction of the requirement of the two years' work of liberal arts preparatory to entering the law college, we may expect an increase in the number of students. It is certain that the change has resulted in very great improvement in the grade of work. The students are more homogeneous. All of them have had the education prerequisite to successful study of the law. Therefore the school is able to maintain a pace which was not possible when it contained immature students who had only the training of the high school.

In the second year of the biennial period there was also established a summer session in law of ten weeks in length. The attendance in this summer session was only 37, but there was a considerable increase in the summer session of 1908, belonging to the next biennial period. It is believed that the work of the summer session will very effectively supplement the work of the college year.

THE GRADUATE SCHOOL.

Growth of the School.—The graduate school has grown more rapidly than in any previous biennial period. The increase in students is from 158 in 1905–6 to 232 in 1907–8. If the graduate students in the summer session were included, the numbers would be 295 for 1905–6 and 402 for 1907–8.

The increase in the number of advance degrees has been proportionally even greater than the number of students. During the biennial period thirty-six persons received the degree of doctor of philosophy, whereas in the previous biennial period the number was only eighteen. Also one hundred twenty received the second degree, master of arts, master of science, etc., whereas for the previous biennial period only seventy-three received such degrees. Thus the total number of doctorates and second degrees for the biennial period is about double the number for the previous biennial period.

Influence of Graduate School upon Undergradute Instruction.—The influence of the graduate school upon the undergraduate instruction is still a subject of inquiry. Upon this matter it may be asserted, without exception, that each department in which there is a strong group of graduate students is recognized by the undergraduate students as one in which there is strong instruction for undergraduates. This is shown by the fact that in those departments where the graduate instruction is strong the undergraduate students are numerous. The mutually helpful relations between graduate and undergraduate instruction has been pointed out repeatedly since the question was raised at Harvard many years ago. When the question of a graduate school came up at Harvard, President Eliot held that the establishment of such a school would strengthen the undergraduate instruction. The soundness of this position was doubted by some members of the faculty. Among these was Professor George Herbert Palmer, a man whose work has been primarily that of an instructor of the undergraduates. In a recent *Atlantic* he gives the argument of President Eliot which changed his view. Said President Eliot: "It is not primarily for the graduates that I care for this school; it is for the undergraduates. We shall never get good teaching here so long as our instructors set a limit to their subjects. When they are called on to follow these throughout, tracing them far off toward the unknown, they may become good teachers; but not before."

Then Professor Palmer adds: "I went home meditating this. I saw that the president was right, and that I was myself in danger of the stagnation he deprecated. I changed my vote, as did others. The Graduate School was established; and of all the influences which have contributed to raise the standard of the scholarship at Harvard, both for teachers and taught, that graduate work seems to me the greatest. Every professor now must be the master of a field of knowledge, and not of a few paths running through it."[1]

The experience of the various departments at the University of Wisconsin completely accords with the experience at Harvard. If the establishment of the graduate school had done nothing else but improve, vivify, and give inspirational power to the undergraduate work, its cost would have been fully justified.

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[1] "The Ideal Teacher" in *Atlantic Monthly*, **99**: 433 (April, 1907).

THE SUMMER SESSION.

The summer session has steadily continued to increase in size and efficiency. The increase in students for the biennial period is from 528 in 1905 to 661 in 1907, an increase of 133. The success of the summer session in the college of letters and science has led to a demand for a summer session in law, and this was established for the second year of the biennial period. While it was not expected that the attendance would be large, it is sufficient to show that the step taken was warranted. While anticipating, it may be remarked that the summer session of 1908, which belongs to the coming biennial period, has shown the largest increase of any summer session, reaching 1,026 or 365 more than for the year 1907.

UNIVERSITY EXTENSION.

University Extension Reorganized.—No step in the progress of the university during the biennial period has been more important than that of the reorganization of the extension division. For many years university extension has been announced in the catalogues. However, aside from agricultural extension, the work consisted mainly in sporadic lectures or groups of lectures in various parts of the state as called for by the citizens. While some correspondence work was undertaken some years ago, until the reorganization of the division it had practically ceased to exist as a real activity of the university. This situation was an extremely undesirable one, and therefore the question arose as to whether the extension work, other than agricultural, in the university should be vivified or killed. Certainly it could not be allowed to continue in a moribund condition.

The enormous success of the commercial correspondence school suggested that here was an educational opportunity which had been neglected by the universities. At my request, Dr. Charles McCarthy investigated the work of the commercial schools with reference to the people of Wisconsin. He found that these schools, while having certain defects, are undoubtedly performing a great educational work, and moreover the astonishing fact was disclosed that many thousands of persons in the state of Wisconsin were taking correspondence work for which they were paying out hundreds of thousands of dollars per annum.

The situation was placed before the regents at the meeting in June, 1906, and as a result of this a small appropriation was granted to begin the reorganization of the extension work. The fund was not sufficient to secure a permanent director of extension. Mr. H. E. Legler, of the free library commission, was so deeply interested in the movement that he consented to act temporarily as secretary without compensation. The response of the state to the offer of the university to do effective extension work was immediate.

The general interest shown in extension was so great before the end of the first year that the legislature of 1907 appropriated $20,000 a year to support university extension. With this fund available the time had come for the appointment of a director. After considering the subject for a long time, the position was finally tendered to Dr. L. E. Reber, dean of engineering in State College, Pennsylvania. Dr. Reber was hesitant to leave an assured position at the head of an important college to undertake this new work, but after investigation he became convinced that here was a great educational opportunity, and finally accepted. Consequently he has been director for one year. Already the university extension division is so strongly organized within the university and is held in such esteem among the people of the state that this division is recognized as of great importance among the branches of the university.

The report of Director Reber shows that the extension work is organized in four departments, (1) correspondence study, (2) instruction by lectures, (3) debating and public discussion, and (4) general information and welfare. In his report he gives fully the scope of the work of each of these departments, and this report I shall not summarize.

Correspondence Instruction.—It is, however, worthy of note that at the end of the first year of the appropriation for extension more than one thousand students are doing regular correspondence work. The weaknesses of correspondence instruction in the past have been (1) that it does not bring together the student and instructor, and (2) that the student works alone. Because of these facts, an unnatural amount of stamina is required of the student, in order that he shall persist in his work. It has been the experience of the commercial correspondence schools that only a small fraction of the students beginning a course continue to the end.

Director Reber has devised a plan which removes these defects. This is the institution of the traveling professor, several of whom are now members of our staff. Once fortnightly, and we hope in the future it may be once a week, the professor meets a group of students in the same subject and thus gives the lively interest which comes from contact with the instructor. At the same time the second defect is overcome. The students, while not necessarily working at the same rate, meet one another in the class room and have the stimulus which comes from a group working upon the same subject.

Cooperation of Manufacturers.—To put this plan into operation required the cooperation of the manufacturers. The professor could conveniently meet the students only at the manufacturing establishments where they are at work. It is most fortunate that in this state the manufacturers have shown an enlightened spirit in this matter. Already a considerable number of the manufacturers in Milwaukee have furnished class rooms for the travelling professors, and have given every encouragement to the men who take work in the extension division even to the extent of paying the men when attending the classes. There can be no doubt that the action of the manufacturers of Milwaukee is practical wisdom; for the men taking extension courses will be improved in their efficiency and earning power both for the manufacturers and for themselves. Of equal, or greater, importance will be the increased good will between the employer and employe because of the interest of the former in the latter.

Debating and Public Discussion.—There are various other lines of extension work which have been markedly successful the first year. One of these is the department of debating and public discussion. There is a strong desire for active intellectual life in the villages and rural communities. Accurate knowledge is desired upon public questions. There has been in the past no way in which this desire could be efficiently met. To illustrate, the debating societies, many of which have existed for a long time, frequently discussed general questions which really led nowhere. This opportunity for educational work has been seized by the extension division. Live political and social questions have been furnished to the debating societies, with syllabi of the sound arguments upon each side, and references to the authorities. By cooperation of the extension division with the free library commission, or by the extension division directly, the necessary material has been sent to the communities. Not only have existing debating societies been thus assisted, but many new literary and debating societies have been formed.

Fundamental Idea Underlying Extension.—The above but illustrates the fundamental idea of the extension division. It is not enough for knowledge to exist in books to be obtained by men under favored circumstances; the knowledge must be carried out to the people. This, of course, is done through the regular school channels in a very large way. But because of unfavorable circumstances there are immense numbers of boys and girls who are obliged to begin a vocation before their education has even passed through the elementary school. It is necessary to supplement the education of the schools by the further education which may be availed of by the adult as well as the child. The university extension division does not compete with the schools or other existing educational institutions. It supplements them all.

The aggressive business man does not wait for the consumer to go to the wholesale establishment to purchase his articles. He gets his products out to the retail stores by advertisement, by travelling agents, and in other ways. Also, more and more, the manufacturer is beginning to establish retail stores in various parts of the country to sell his goods. Are we to be less aggressive in education than we are in business? It seems to me that the proper answer is clear. If the nation is to solve the various great questions which are before it, if the people are to succeed in obtaining a favorable material environment, if they are to gain a reasonable intellectual and spiritual life, it must be by carrying to the masses the knowledge which the scholars and investigators of the world have obtained, and such is the purpose of the extension division of the university.

THE FUTURE CONSTRUCTIONAL DEVELOPMENT OF THE UNIVERSITY.

Study upon the plans for the future constructional development of the university has been continued during the biennial period by Architects Warren P. Laird and Paul P. Cret, and with these men Mr. John Nolan has been cooperating from the point of view of the landscape architect. Their plans are far advanced, and will be submitted to the regents during the coming fiscal year. It is believed that these comprehensive plans will mark a new epoch in the constructional work of the university. Buildings will not be placed at random; materials will be selected so as to produce harmonious effects. Each group of subjects, as for instance, liberal arts, the pure sciences, engineering, agriculture, women's halls of residence, men's halls of residence, etc., will be assigned a definite part of the university grounds at a sufficient distance from the other groups so that for many years there will be room for growth without interference.

The wisdom of having a broad plan for the future constructional development of the university is obvious, when we consider its recent rapid growth. During the past ten years the number of students has more than doubled, in that time increasing from 1,900 to 4,013. If this rate of increase continues, and the increase has been more rapid the second half of the ten years than the first half, in less than thirty years we shall have at the university more than ten thousand students. These figures show how imperative is large constructive imagination in planning for the future of the university.

RETIRING ALLOWANCES FOR UNIVERSITY PROFESSORS.

On March 31, 1908, Mr. Andrew Carnegie announced the gift of $5,000,000 additional to the trustees of the Carnegie Foundation for the Advancement of Teaching in order that state universities may be included in the benefits of that fund. The Carnegie Foundation provides retiring allowances for men who have reached the age of sixty-five, and who have been of the rank of assistant professor or higher rank for fifteen years, and to men who have been of this rank for twenty-five years without reference to age limit. The retiring allowances are upon a liberal basis. Moreover, if a professor on the list of the beneficiaries, or entitled to be on such list, dies, his widow receives one-half of the retiring allowance to which he is entitled.

One of the very great difficulties, not only in state universities, but in other universities, has been that when men have lost the vigor of youth, it has not been practicable to retire them. The salaries paid them during their service have been so low that in the great majority of cases the accumulation of a reserve adequate for support during the remainder of life has not been possible.

Consequently men have been continued on the instructional force after they should have been retired. The advantages of having retiring allowances for university professors are so obvious that they need not be dwelt upon. Mr. Carnegie inserted one condition for the inclusion of the state universities in addition to those that apply to private foundations, viz., that the application of the regents should have the approval of the governors and the legislatures.

THE UNIVERSITY BULLETIN AND THE PRESS BUREAU.

The very rapid growth in the research work of the university has very greatly increased the number of monographs which require publication. For several years, because we had no university editor, the publication of the result of the investigations had been much delayed, and there had accumulated a large amount of material.

Therefore the regents, at the end of the first year of the biennial period, established the office of university editor, and Mr. F. W. MacKenzie was asked to take the place. At the end of the first year he reports that the scientific bulletin of the university has been brought up to date. During the biennial period, July 1, 1906, to June 30, 1908, there have been twenty-two issues. Hereafter we may expect that the results of the research work in the university will promptly reach the people. The publication of the general series of the university, such as the catalogue and departmental announcements, requires a large amount of time for editing. The handling of this series by the editor has relieved several of the professors from a considerable amount of editorial work and thus has given them more time for their regular duties.

During the biennial period the press bulletin has continued to furnish, to the papers of the state, advance announcements of the results of the research and investigations that have been carried on at the university. It has kept the public informed in regard to the educational development of the university. Also bulletins have been sent to a large number of weekly and daily papers outside of the state so that the results of the work of the university have reached a national audience.

PART II.—THE NEEDS OF THE UNIVERSITY.

INCREASE IN SALARIES.

The question of salaries in the university is one which has been much considered by the board during the biennial period, but it still remains one of the serious questions which confront the university authorities, since during the past few years the cost of living has increased much more rapidly than has the salary scale in the university. The increase in salaries is first considered among the needs of the university for the reason that this necessity applies equally to all colleges.

In the autumn of 1907, the last year of the biennial period, the average salaries of the various classes of the instructional force on the basis of full pay and full service were as follows:

68 professors	$2,772.05
13 associate professors	2,083.15
53 assistant professors	1,635.84
106 instructors	1,064.90
Average of all	$1,730.33

A small increase in the scale of salaries in the university began in 1905–6, when the income from the two-sevenths of a mill tax first became available. Therefore I give the average salaries for 1904–5, the year antecedent to the increase. For this year the average salaries were:

56 professors	$2,443.75
8 associate professors	1,912.50
36 assistant professors	1,563.88
83 instructors	927.71
Average of all	$1,560.38

It is to be remembered that the actual average salary in the university is even lower than $1,730.33, for the assistants, 68 the year 1907–8, the lowest paid men in the instructional force, are not included in the above figures. The reason for the omission is that the assistants are not expected to give their full time to the university, and their pay varies in proportion to the time they give and thus they cannot be fairly included in averages since that would make them too low; but on the other hand their omission altogether makes the averages too high.

From the foregoing table it appears that during the past three years the total increases in average salaries are for

Professors	$328.50
Associate professors	168.65
Assistant professors	71.96
Instructors	137.19
Average of all	169.95

If these increases be changed to percentages the total increases for the full three years are as follows:

Professors	13.4%
Associate professors	8.8%
Assistant professors	4.6%
Instructors	13.6%
Average of all	10.9%

For many years prior to three years ago the salaries had remained substantially horizontal. The increase in the cost of the necessities of life, during the last few years, has been very great, as is shown by the following extract from the bulletin of the United States Bureau of Labor, Vol. XII, p. 338:

"In 1905 the increase in prices as compared with other years is as follows:

"Farm products, 58.6 per cent higher than in 1896; food, etc., 29.7 per cent higher than in 1896; clothes and clothing, 22.9 per cent higher than in 1897; fuel and lighting, 39.4 per cent higher than in 1894; metals and implements, 41.8 per cent higher than in 1898; lumber and building materials, 41.4 per cent higher than in 1897; drugs and chemicals, 24.1 per cent higher than in 1895; house furnishing goods, 21.5 per cent higher than in 1897; and the articles contained in the miscellaneous group, 23.4 per cent higher than in 1896."

According to Bradstreet the average prices in March, 1907, were 60 per cent above the average prices of July, 1896. This figure is somewhat higher than that of the Bureau of Labor which gives 44.4 per cent as the average increase in the price of all commodities for the year 1907 as compared with the average of 1897.[1]

It thus appears that the increase in salaries during the past three years has not nearly kept pace with the increased cost of living and we are now farther behind in a just salary scale than we were three years ago when the policy of a gradual increase was inaugurated by the regents.

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[1] *U. S. Bulletin of Labor*, March 1908, p. 297.

Thus notwithstanding the recent small increases in salaries, members of the instructional force have found it more difficult to live within the income derived from the university than was the case a few years ago.

But the question arises, is there any likelihood that a reverse tendency will take place and prices permanently fall? This question is answered in the negative by economists. According to the director of the mint the value of the gold in public treasuries and in circulation in the world in December, 1906, was $6,888,900,000. The product of the mines of the world during the last dozen years has been more than half of this amount, and thus the world's available gold supply has doubled in that time. It is notable that this enormous increase in the world's available gold supply has taken place during the same period in which the average price of all commodities has increased 44.4 per cent. The above facts show that what has really happened is that the value of gold has fallen, but as this commodity is the standard of value, prices have risen as compared with the standard. Therefore, the supposed increases of salaries of the professors during the past three years have not been real but only apparent. As a matter of fact, in real value the average of the salaries is now less than it was three years ago.

In view of these facts it is natural to find that the change in the salary scale of the university is merely an incident to the general salary advance in other large universities and in other walks of life.

At Harvard in 1904–5, recognizing the great increase in cost of living, even at that time, a new scale of salaries was introduced in the college of liberal arts, as follows:

"Professors on appointment, $4,000, usually increased but not as a matter of contract by steps of $500 every five years to $5,500; assistant professors, appointed for a term of five years, $2,500; assistant professors reappointed for a term of five years, $3,000."

At Yale the standard of salaries, according to the president's report in 1906, for many of the professors was raised from $3,750 to $4,000, and President Hadley goes on to say: "But this should be regarded as only a beginning. Just as soon as the university finances admit it, there should be a further increase to $4,500 and then to $5,000, or even $6,000."

At the University of Toronto, a state institution younger than our own, the professorial salary has until this year been $3,200. Realizing the situation as to changing standards, the province of Ontario largely increased the appropriation to the institution, and the salaries at one jump have been increased by ten per cent, or to $3,520, and already there is talk that the standard at that university should go to $4,000.

But perhaps of greater significance than the increase of salaries of eastern institutions is the recent action of the University of Minnesota. The hardships imposed upon professors because of the rapidly advancing cost of living were so well understood in the state that, at the last legislature, there was a large increase in the appropriation for the special purpose of raising the salary scale. By President Northrop I am informed at the present time that several professors receive salaries of $3,500, and that others receive salaries of $3,200, $3,000, $2,700, and $2,500. He tells me that the maximum salary was $2,700 until last year, with one or two exceptions. These figures show that the increase in salaries at the University of Minnesota at one leap has been as great or greater than the total of the gradual increases made in Wisconsin during the past three years, and that the average salary for professors is fully as large as at Wisconsin. At Minneapolis rents are lower than at Madison, and as nearly as I can learn if there is any difference in the cost of living in other respects the advantage is in favor of Minneapolis.

In my opinion, as soon as the resources of the university permit, at the very least the salaries of professors in the university should be sufficiently advanced to compensate for the depreciation of the standard of payment, so that the members of the instructional force will be as well paid as they were a number of years ago.

It is undoubtedly true that professors are more poorly paid than men of equal attainment and ability in any other line of life. I would not ask that the scale of compensation of professors be fixed upon the basis of the money-making callings, for I would not have the teaching profession become one in which remuneration for service is the chief motive. But it seems clear to me that the salaries of the professors of the university should be sufficient so that they may live upon their incomes from the university without relying upon other sources, and at the same time, if economical, save a small percentage of their income each year.

But whether or not we all share in this belief, it will be necessary to maintain the salaries at a standard so that we can meet competition from other institutions. This matter has been presented to the regular committees of the legislature and a special committee of the recent extra session. Several members of these committees have repeatedly told me that we should pay sufficient salaries to hold our best men.

By the legislature of 1905 the salaries of the circuit judges were raised from $4,400 to $5,000. It is believed that so far as attainment, ability, and importance of service are concerned the full professor in the university is fairly equal to the circuit judge of the state. The reason assigned to the legislature for increasing the salaries of circuit judge from $4,400 to $5,000 was that without such an increase men of a sufficiently high grade to satisfactorily perform their duties could not be secured to go on the bench.

While I am not for a moment suggesting that the standard salaries of the professors should be raised to $5,000 in the near future, I mention the point merely to express my profound conviction that the legislature and the people will be practically unanimous in insisting that the salaries in the university shall be sufficiently high so that the present standards as to men shall not be lowered. The difficulty in filling chairs with men who are at once strong teachers and good scholars and men of a type who will interest themselves in the students is very great. If the heads of the departments, the deans, and the president could give an exact accounting of the time spent in filling satisfactorily vacant positions, doubtless the board would be surprised to know that this matter, in the time which it occupies, is one of the most taxing. After authorization for an appointment of professorial grade has been made by the regents, it has often been from six months to a year, and in some cases two years, before a nomination could be made.

If any one duty of the educational officers of the university were indicated which is more important than any other it is that of nominating members of the instructional force to the regents. If this work be done successfully the character of the university is assured. But we who have the problem of making nominations to the board realize the difficulty of its satisfactory performance and therefore whenever we find that we have within the faculty a person who as a teacher, a scholar, and a man, is altogether satisfactory, we are extremely reluctant to see the prize go to some other institution because we cannot meet their salary standard.

I report upon this matter in order that you may be fully acquainted with the situation. It seems to me that there is no question that we must advance as rapidly in our standard of salaries as is necessary in order to meet competition in the rise in salaries of other institutions. To pursue any other course would degrade the University of Wisconsin to a second rate institution. Buildings, apparatus, and books, are the shells of the university. The men who constitute its faculty are its living force. If these men are not of the highest grade, however magnificent the buildings and munificent the equipment, the results in instruction and investigation will be inferior to what the state is demanding.

The foregoing statement of facts fully justifies the request that the salary scale of the university be increased by twenty per cent. If this be done, the instructional force will be in no better position than they were before the recent rapid increase in living expenses. Simple justice to the instructional force requires that the increase in salaries be commensurate with the increased cost of living. To make a twenty per cent increase will require somewhat more than $100,000 per annum.

In addition to the funds required to increase the average salaries of the staff, it is necessary to make additions to the staff practically in proportion to the number of students. It has already been seen that during the past two years the proportional increase in the faculty has been about the same as the increase in students.

For the autumn of 1908 the increase in students according to the directory is 8.3 per cent as compared with the directory of the previous year. If the efficiency of instruction is to be kept up, it is certain that the instructional force must be further enlarged. Thus we must anticipate that in order to maintain salaries at a just scale, and to secure an adequate instructional force, will require, for the coming biennial period, many thousands of dollars beyond the expenditures for this purpose during the biennium which has just closed.

THE COLLEGE OF LETTERS AND SCIENCE.

Additional Force Necessary.—In the college of letters and science there are various departments which need to be strengthened. Perhaps the most pressing case is that of biology. The college has grown so rapidly that Dr. Birge, who has retained the title of professor of zoology, is obliged to give his entire energy to the work of dean. Therefore there should be secured a strong man to take the position of professor of zoology. Also a professorship of plant pathology should be authorized at once. Many of the medical branches are built upon zoology, and the diseases of plants are of fundamental importance to agriculture. The establishment of a college of medicine, and the rapid growth of the college of agriculture, as well as the growth of the college of letters and science, are all pressing reasons for strengthening the department of botany.

Several years ago I was authorized to secure a professor of the history and appreciation of art. This authorization has not been acted upon because of lack of funds to secure the necessary illustrative material. Of all lines of liberal training, we in the middle west are most deficient in art. The coming year the necessary material should be secured, and a professor of the history and appreciation of art should be appointed.

Biology Building.—The department of biology has been hampered for several years because of inadequate laboratory accommodations, as have also the departments of physics and geology. The conditions which demand the construction of a biology building are fully discussed by Deans Birge and Bardeen. Already the plans are far advanced. The beginning of the year 1909–10 there will be available the fifth year of the $200,000 fund for educational improvement. A part of this fund can go to the construction of this building, but the amount that can be taken from it will not be adequate, and therefore it is imperative that the permanent educational improvement fund be extended for two years more, in order to build the biology building and to provide for other necessities which are later mentioned.

In connection with the building for biology there should be constructed on the shore of Lake Mendota a laboratory in order to study the fresh water life of the lakes of the state.

Course for the Training of Teachers.—Another pressing necessity of the college is the further development of the course for the training of teachers. This course has been in progress for some years, but as pointed out fully in the reports of Dean Birge and Professor Elliott, it is necessary to establish additional departmental teachers' courses, a director of the course should be appointed, and there should be established a considerable number of teaching fellowships to be assigned to the high schools of the state.

While cooperation has been undertaken with the city schools of Madison for observation work and a certain amount of practice work, both in the high school and in the elementary schools, it is recognized that this is not a complete solution of the problem of the training of the large numbers of teachers required for the secondary schools. The university should have an elementary school and a secondary school directly under its charge, in which observation and practice work may be done by the university students, and which schools may also serve as the laboratory of the department of education.

A building for a model school will probably require not less than $150,000.

It was seen two years ago that to develop the course in education properly, would require a considerable sum of money. Therefore when authority was asked to establish a medical college $50,000 was asked for that purpose, the idea being that the additional cost of the course in education could be paid for out of the income of the two-sevenths of a mill tax. The authority for the establishment of a medical college was granted, but the appropriation asked for was not made. Thus it became necessary to provide for the training of teachers and for the first two years of the medical school out of the current income. The result is that neither has been developed as it should have been. While as much progress has been made as practicable, it has not been possible to put completely in operation the plans for the training of teachers which have been formulated by the faculty, nor has it been possible to develop the medical work as it should have been done.

Wing to Chemical Laboratory.—The new chemistry building was occupied the first of January, 1906. Professor Kahlenberg, of the department of chemistry, reports that already at the end of two and one-half years, the building is fully occupied. At the opening of the semester of 1908–9 over six hundred students began chemistry. To accommodate these students it has been necessary to place additional tables in the aisles of the laboratory on the first floor. On the second floor all the places for analytical chemistry but six are occupied. On the third floor, in the organic chemistry laboratories, one desk only is not occupied.

Considering the size of the beginning class of 1908–9, it is clear that in the autumn of 1909–10 the laboratories on the second and third floors will be too small to accommodate the large number of students that will require the work of the second and third years. Also if there is even a normal increase in the number of beginning students in 1909–10, it will be difficult to accommodate them in the elementary laboratory. Therefore Professor Kahlenberg urges that one of the wings of the chemical laboratory be ready for occupancy not later than the autumn of 1910. To construct and equip this wing will probably require about $45,000.

Research Work in Letters and Science.—The college of agriculture spends a considerable fraction of its income for research work. In the college of engineering the policy was adopted two years ago, of appropriating money for research work which could be used for the employment of assistants, instructors, etc. As I shall explain below this fund should be increased.

The time has now come when there should be a definite fund for research in the college of letters and science. There is no reason why the principle of the appropriation of funds for research should not be recognized in the college of liberal arts, the same as in the schools of applied science. I would not advocate that so large an amount of money be appropriated for research in the college of letters and science as in engineering or agriculture. Indeed, it is not necessary that the sum for this purpose be large at the outset. Under the rule of the regents the duties of the professors are those of instruction and investigation. In accordance with the rule, the professors in the college of letters and science are now carrying on many lines of investigation which are aimed toward the material, intellectual, and spiritual upbuilding of the state and the nation. The main purpose, therefore, of a definite fund would be to secure apparatus and assistants, which are required in order that professors may work under favorable conditions and therefore with the highest efficiency. Probably $5,000 per annum would be adequate for immediate needs.

THE COLLEGE OF MEDICINE.

The new college of medicine requires more funds in various directions.

As already indicated, two years ago $50,000 was asked for the medical department and for the hygienic laboratory. While authority was given for the establishment of the college no appropriation was made for its maintenance. The sum of $50,000 per annum should now be asked of the legislature for this college. With this sum it will be possible to put the two years of the medical work on a firm footing, and to establish the work of the hygienic laboratory on a broad basis.

The Hygienic Laboratory.—The amount which we are able to devote to the hygienic laboratory, is very small as compared with other states. This should have a sufficient fund to cooperate with the physicians in the diagnosis of diphtheria, tuberculosis, rabies, etc. A sanitary survey of the water of the state should be made. The various serums which are used in the state should be tested and certified by the laboratory. To do these things satisfactorily will require several times as much money as now goes to the laboratory. It is certain that whatever money goes into the hygienic laboratory would result in producing a higher average health of the people.

Apparatus and Books.—The new departments of medicine established at the university are naturally very deficient as yet in laboratory equipment and books. Considerable amounts of money should be spent for several years in furnishing the necessary equipment for these departments. To meet these material needs of the college of medicine will require an annual expenditure for apparatus and books of not less than $5,000 a year for a period of years.

Medical Building.—It is proposed to house the departments of physiology, physiological chemistry, pharmacology, and toxicology in the new biological building, but this location can be no more than temporary. Indeed, the plan to put these departments in the biological building has met with protest on the part of the professors of botany and zoology, who state that the building as planned will not be too large to meet the needs of the department of biology in the near future.

While, therefore, it may be practicable to locate these departments in the biological building for several years, we should anticipate in the near future the construction of the medical wing of the biological group of buildings, to house the departments above mentioned, and also the departments of bacteriology, pathology, and the hygienic laboratory, temporarily located in south hall, and the department of anatomy now in science hall. This wing will cost not less than $150,000.

The needs of the medical college give further reasons for an extension for a period of years of the permanent improvement fund for educational purposes.

THE COLLEGE OF AGRICULTURE.

Increased Cost of Faculty.—In the college of agriculture the same reasons apply as to the necessity for increasing the staff, that apply in the college of letters and science. The autumn of 1908, the growth in students in the long course in agriculture, including the middle course, is more than fifty per cent over that of the year 1907-8. There is every reason to believe that the number of short course students will also continue to increase. If the efficiency of the college is to be maintained, the faculty must be increased. Already demands for instructional work upon the faculty are so onerous, that the investigational work, of so much importance to the people of the state, is suffering.

Poultry Department.—A poultry department should be added to the college. For a number of years there have been very numerous requests for instruction in poultry. It has not been possible to give this instruction because of inadequate funds to establish this department and at the same time to carry efficiently existing departments. The transfer of the department of home economics to the college of agriculture makes it even more desirable that a poultry department be established at once.

Additional Constructional Work.—Of the material equipment needed by the college a live stock pavilion stands first. Fortunately contracts have already been awarded for this pavilion and it will be constructed during the coming year, so as to be available not later than the autumn of 1909.

The rapid increase in the number of students in the long course has made it very difficult to handle their dairy instruction in the present dairy building. During much of the year this building is now used to its full capacity to accommodate the short and dairy course students. Within the next year, if possible, the dairy building should be extended to the north, or else the pavilion west of the dairy building should be much enlarged for the use of the long course students. The soils building is very greatly congested and a wing should be added at once.

As soon as practicable an entirely new horticultural building should be constructed to accommodate the department, and the quarters now occupied by horticulture should be turned over to the soils department.

The live stock pavilion, the horticultural building, the additions to the dairy and the soils building must be paid for from the fund for the permanent improvement of the educational facilities of the university, and therefore these needs of the college of agriculture furnish another reason for the extension of this fund for a period of years.

The barn on the Hill farm is in a tumbledown condition. A new barn should be built there at once and it is also necessary to reconstruct other buildings there located. Also there should there be built quarantine quarters to study the diseases of animals.

The green houses for the horticultural department are entirely inadequate, and it will be necessary to construct additional green houses so placed that they will join on the new horticultural building which will be required in the near future.

The funds of the college have been so wisely administered that it appears probable that there will be available a sufficient surplus to provide for the constructional work on the Hill farm, and for the green houses, from the funds of the college.

Connection with Central Heating Station.—The agricultural college should be connected with the new central heating station. At the present time the agricultural heating plant is driven to its utmost capacity. Indeed, it is doubtful if, when the new live stock pavilion is completed, it will be possible to heat all the buildings in very cold weather. It would be extreme'y unwise to spend an additional amount of money on the present agricultural heating plant since there we are obliged to burn an expensive coal and to haul the coal some distance. Next year, if possible, this plant should be abandoned, and the agricultural buildings connected with the central heating plant, and thus save money in the fuel bill. The cost of this is later considered in connection with the central heating station.

More Land Needed.—The importance of the work of the university in raising high bred seed to be distributed throughout the state is dwelt upon by Dean Russell. It has been repeatedly shown that the state gains millions of dollars per annum as a result of the seed work of the university. For the past years we have been able to furnish only a portion of the amount of these high bred seeds which have been asked for by the farmers of the state. Moreover, it has been only within the past three or four years that the importance of this work has been appreciated by the people, so that the demands for high bred seed are rapidly growing. It is certain that the expenditure of money for a sufficient amount of land to furnish all the high grade seed which the state requests would be repaid many fold, but to raise this seed will require more land. Already a lease has been taken upon one tract of seventy acres, with the privilege of purchasing for $15,000. But this land will be wholly inadequate to meet our needs in this matter. There should be available at once $50,000 to purchase land for the agricultural department, this additional land to be largely used for the raising of pure bred seeds for dissemination to the state.

Extension Work of the College.—Additional permanent substations should be secured in central Wisconsin for studying the peaty and sandy soils. Probably tracts of land suitable for this purpose, with the necessary building and equipment, can be secured for about $6,000.

The vast amount of good which the college of agriculture has accomplished through extension is well known to the state. The lines of work which the state has been carrying on in this direction have been mentioned by Dean Russell in his report, and large plans are given for further work.

The following lines of demonstration work should be carried on:

(1) Spraying potatoes for blight, (2) Spraying and renovating orchards, (3) Plant breeding work, corn, barley, oats, tobacco (4) Weed eradication by iron sulphate, (5) Tuberculosis, a. testing, b. post mortems, demonstrations at county fairs,

institutes, etc., (6) Drainage service, (7) Butter and cheese scoring exhibits, (8) Improvement of horse industry, (9) Dairy tests, (10) Cranberry work, (11) Seed control, (12) Northern sub-stations, (13) Extension courses at county agricultural schools and elsewhere through the state given by various members of the staff.

Also it is necessary to continue the following lines of investigation and control work:

(1) Nursery inspection, (2) Feed inspection, (3) Fertilizer inspection, (4) Stallion inspection.

Any appropriations which the legislature may make for these lines of agricultural extension work go directly to the people of the state. They are not for the students in attendance at the university either directly or indirectly.

THE COLLEGE OF ENGINEERING.

Increase in Cost of Staff.—In the college of engineering, in order that the efficiency of the college may be maintained, there is the same necessity for increasing the salaries of the staff, and the number of the staff, that there is in the college of letters and science and the college of agriculture.

Research Work.—Of the expansions asked by the dean of the college, he places foremost that of increasing the fund for research work. For two years there has been available for this work $4,500 per annum. As a result of the expenditure of this sum, ten bulletins have been published, all of which are of direct importance to the state. The college is now carrying on a large number of other investigations. The fund made available by the regents has been supplemented by $2,500 a year from the Carnegie Institution, and by $5,500 from the American Engineering and Maintenance of Way association. In order still further to increase the efficiency of the college, both in the way of instruction and in the solution of the engineering problems of the state, it is important that the college have $10,000 a year for investigations. The college of engineering of the University of Illinois has $100,000 per annum for a like purpose and for constructional work in connection with the same.

Additional Buildings.—It has already been seen, p. 14, that the students have increased in number very rapidly during the past two years. Already the present buildings are entirely inadequate to meet the instructional and laboratory requirements of the college. When the departments of physiology, physiological chemistry, pharmacology, and toxicology are removed from the old chemical building to the new biological building, there will be some slight relief to the chemical engineering course. If practicable, it would be advisable to construct at once an entirely new engineering building which would be adequate to meet the needs of a college of at least 1,200 students. The present building was constructed when there were about 400 students in the college and it now contains about 900. Considering the other very pressing needs of the university, it, however, hardly seems possible to construct an adequate engineering building immediately, which probably ought to cost not less than $300,000. Temporarily, to meet the pressing need, two short wings should be added to the present engineering building at a probable cost of about $25,000 each.

The new mining department will probably find temporary laboratory accommodations in the old central heating plant when the boilers are taken out.

In the near future we should look forward to the complete reconstruction, or rather we should look to building entirely new buildings for the machine shops and the mechanical laboratories. The pressing requirements of the college of engineering furnish still further reasons for the extension of the educational permanent improvement fund of the university.

BUILDINGS FOR GENERAL PURPOSES.

New Pumping Plant.—In my report for the previous biennial period it was pointed out that the present pumping plant of the university is entirely inadequate, and would be incapable of meeting the demands put upon it in case of a serious fire. The superintendent of the pumping plant, Professor D. W. Mead, has year after year urged that this plant be entirely reconstructed at the earliest possible moment. However, our other necessities have been such that we have been unable to do this. To construct a pumping plant which shall be adequate to the real needs of the university, and which shall serve as an educational model for the students of the university, will require the expenditure of $15,000 to $25,000.

Additional Equipment for Central Heating Station.—While a sufficient number of boilers have been installed in the central heating station to heat the buildings other than agricultural, and provision has been made to carry these buildings for the year 1908–9, the plant is far from completion. When same is connected with the agricultural buildings there will be required additional boilers, stokers, breeching, piping, and tunnels, the total cost of which is estimated at about $35,000. As soon as the biology building is completed boilers and connections for this building will require approximately $7,000. Also, the heating station should be provided with apparatus for keeping daily records of the coal burned, water evaporated, condition of the flue gas, etc., so that same may be operated as a model plant. To equip this plant with the necessary apparatus to carry on these determinations will require the expenditure of $3,000.

Further, in the near future the plant should be provided with superheaters which will involve an expenditure of about $10,000.

Thus the additional amount of money which must be spent upon the central heating plant in the near future beyond the expenditures for the year 1908–9, which have already been authorized, will be $55,000.

Installation of Power for Electric Lighting, etc.—Unless within a short time we have assurances that electric current, sufficient to furnish us power and light, can be delivered from the Kilbourn dam, we should install dynamos for this service, since it is certain that by combining a heating and lighting plant we can furnish our own light much cheaper than it can be purchased. Accurate estimates have not been made of the cost of the construction of a power house and the cost of installing machinery, since there are so many other pressing necessities at the university which, during the coming two years, must take precedence.

University Museum.—In my report for the previous biennium, I spoke of buildings which are very much needed by the university, but for which there seems to be no hope that funds will be available within a few years. First, and most important of these, is a museum. The state of Wisconsin has no general museum. The plans for the future constructional development of the university place such a museum as the north part of the court of honor, the south side of which shall be Henry Vilas theater, the west side university hall, and the east side north and south halls. The general educational purposes of a museum are so well known that they need not be amplified. At Washington is the National museum. Many of the states have general museums. The city of New York has the American Museum of Natural History. The city of Milwaukee has a large museum. Certainly the state of Wisconsin should have a museum which should be located at Madison and on the university grounds, so that the material in this building may serve the educational purposes of the students who are attending the university, may furnish the staff material for investigative work, and also be available to the people of the state whenever they visit the capital city.

Drill Hall.—The director of physical training and the commandant of the military department from time to time call my attention to the continuous interference of their departments, due to the necessity of occupying the same building. As early as possible a drill hall for the military department should be erected at Camp Randall, so that the gymnasium will be available for the department of physical training. Such a drill hall should have one room provided with shower baths, so that it could serve the men who desire to engage in out of door sports, and thus make it unnecessary for them to use a building for changing clothes a half mile away from the athletic field. The plans for the future constructional development of the university permanently locate the drill hall upon Camp Randall. The cost of an adequate building for that purpose has not been accurately estimated, but the probable cost will be not less than $75,000.

Halls of Residence.—During the second year of the biennial period there came available the first $100,000 of the annual appropriation for four years for student buildings. Under this grant the women's building, to serve as a women's gymnasium, a union for the women, and as a supplementary dining hall, is under construction and will be completed so that it will be ready for occupancy the autumn of 1909. The construction and equipment of this building will require from $200,000 to $225,000, leaving from $175,000 to $200,000 to build the first of the men's dormitories. With this money it is hoped to construct the first of the halls of residence for men during the coming biennium.

If the state continues the appropriation of $100,000 for a series of years, at the end of ten years or more there will be available student buildings to accommodate from 1,000 to 1,250 students; but it seems most unfortunate to wait for this work to go on so slowly. With the increase of students from 250 to 300 a year, under the most favorable cirmumstances, the construction would not keep pace with the growth in students, and we shall be farther behind in meeting the real demands of the students for living quarters at any period in the future than we are at the present time.

The pressure is very great for accommodations in Chadbourne hall. It is certain that if another hall for women were available it would have been filled this year.

It is our plan to have each of the buildings for the men and the women a complete home, each to contain student rooms, a common room, and a dining hall. For the women, these halls should be of a size to accommodate from sixty to one hundred each. For the men, probably one hundred fifty in each hall is about the right number, and the range per hall should be somewhere between one hundred twenty-five and one hundred seventy-five.

If instead of $100,000 per annum, we had $200,000 per annum for the construction of student buildings, for a period of five years, we would be able within a reasonable period to provide homes for a considerable fraction of the students, but certainly only a portion of those that would gladly have the advantages of living in a hall of residence under the control of the university. The immense importance of such residential halls to the students of the university has been presented in my previous reports and will not be again discussed.

UNIVERSITY EXTENSION.

In order to take full advantage of the opportunity for extension work, it will be necessary to greatly enlarge the fund for this purpose beyond the $20,000 per annum now available. Offices subordinate to the central office at Madison should be opened in a number of places within the state, probably at least one in each congressional district. There should be large additions to the present extension faculty. The director states that the full time of a number of additional teachers is needed at once. Also, if the department of instruction by lectures is developed, several men should be secured who will give their time wholly or in large part to that department. To carry on the routine work of the subordinate offices and to do promptly the work in correspondence will require a considerable force of stenographers and clerks.

The needs of the extension division are given in detail in the report of the director. To carry out effectively his large plans to carry knowledge to the people of the state will require an appropriation several times that now available.

AUTHORIZATION FOR TEMPORARY TRANSFER FROM GENERAL FUND.

It will be necessary to have the law continued for two years, authorizing the temporary transfer from the general fund to the university fund income, in anticipation of the payment of two-sevenths of a mill tax. Under this law, for the year 1905–6 there was borrowed from the general fund, in anticipation of the payment of taxes, $302,000. The finances of the university had been placed in such shape before the year 1907 that the regents asked that this law be continued, with the provision that the maximum amount to be borrowed would be $250,000, and for the year 1907–8 this was the amount borrowed. The finances of the university have been so handled as to accumulate a balance at the end of the fiscal year, June 30, 1908, amounting to $99,974.86. Consequently, in the authorization to continue the transfer from the general fund to the university fund income, the amount for one year may be limited to $200,000.

WING TO HISTORICAL LIBRARY.

While not under university supervision there is one other piece of constructional work which should be mentioned, that is, the north wing of the historical library building. In this building are housed the historical library and the university library. It is now full from garret to basement. The book stacks are crowded, the seminary rooms are inadequate, the museum is full. Both from the point of view of the university, as well as of the historical society, it is imperative that funds be made available by the coming legislature for the construction of this wing. This matter is much more fully discussed by the university librarian in another part of this report, and is also covered by R. G. Thwaites, secretary of the State Historical Society, in the report of that institution.

SUMMARY.

Summarizing, it therefore appears that to enable the university approximately to meet the most pressing needs in order to perform for the students and the state the work that it should do, will require the following appropriations:

1. For increase in income. To place the salaries of the professors in as favorable a position as they were before the great increase in cost of living, will require $100,000 per annum.

For the medical college and hygienic laboratory, $50,000 per annum are needed, it being understood that this appropriation will release funds in the college of letters and science so that the course for the training of teachers may be developed.

This necessary increase in permanent income may be met by increasing the two-sevenths of a mill tax to three-eighths of a mill. This change would mean that the farmer or business man who pays directly or indirectly to the support of the university $1.43 per annum on an assessed valuation of $5,000 would in the future pay $1.87, an increase of 44 cents. Do not the returns which the university has already made to the people of the state, justify the belief that this increase will also be justified?

The question may be asked why this needed increase in income cannot be provided for out of the existing two-sevenths of a mill tax. The answer to this question is that the annual increase of income, due to the increase in assessment, is no more than sufficient to provide for the normal expansion of the university. As already seen the rapid increase in students requires each year an enlargement of the instructional force. The increase in students for the autumn of 1908 amounts to 8.3 per cent over 1907. Also, every time a new building becomes available this adds to the running expenses of the university for heat, light, water, and janitor service. Finally, it has been the desire of the legislature that a surplus be accumulated, so as not to make it necessary to continue indefinitely the authority to borrow from the general fund in anticipation of the payment of taxes. As has already been indicated, for three years the amount has been reduced by $25,000 per annum, and it is planned to continue this policy. This factor alone uses a large fraction of the annual increase from the two-sevenths of a mill tax.

2. The permanent educational improvement appropriation of $200,000 per annum, which has been made for five years, should be enlarged to $300,000 per annum, and extended to seven years, in order to provide for the pressing constructional work, to buy the needed apparatus and books, and to purchase the necessary land. On the basis of $200,000 a year for our permanent educational improvement fund, we are getting farther and farther behind in the construction of needed buildings and other permanent improvements.

We have seen that in order to provide for immediate educational needs in the university will require the following buildings, (a) biology building, (b) building for training of teachers, (c) wing of chemical building, (d) medical building, (e) live stock pavilion, (f) additions to dairy building, (g) wing to soils building, (h) wings to engineering building, (i) pumping plant, (j) completion of tunnels and equipment of central heating station, (k) drill hall.

Also, in the near future, a power plant for electric lighting should be installed, a horticultural building should be built, and a university museum should be constructed. It is to be remembered further, that out of the educational permanent improvement fund apparatus and books must be paid for, as well as permanent improvements in the existing buildings. Finally, the additional land needed for the department of agriculture should come out of this fund.

The appropriations which have already been made of $200,000 a year are available for the years 1908–9 and 1909–10. These funds are not sufficient to complete the central heating station, to construct the live stock pavilion, and the biology building, and to provide repairs and improvements, books, and apparatus for the coming biennial period. Thus buildings, improvements, etc., beyond those just mentioned, and in part those mentioned, must be provided for by a continuance of the permanent educational improvement fund.

3. The appropriation of $100,000 per annum for four years for student buildings should be amended, so that the amount shall be $200,000 per annum, the increase to take effect July 1, 1909, and the appropriation of this amount should be for a period of not less than four years.

4. The appropriation of the university extension division should be greatly increased. The amount of money available

for this work at the present time is only $20,000 per annum. Stating it very conservatively, it is certain there can be used to the advantage of the state five times this amount of money. The appropriation for extension is not in any sense for the university. It is an appropriation every dollar of which is spent through the university for the people of the state.

5. The continuance for two years of the act authorizing the temporary transfer from the general fund to the university fund income, limiting the amount under such authorization to $200,000 per annum.

CONCLUSION.

It has been intimated to me that the state has been rather liberal to the university, and that we ought to get along with current appropriations. The state has been liberal to the university, but the liberality has been fully justified in results. It is for the legislature to determine whether the liberality shall continue to the university, commensurate with its needs and its opportunities to serve the state. It is clearly the duty of the regents of the university to place before the legislature the needs of the university in order to carry on the work for the students here, in order to do the investigational work, agricultural, engineering, and otherwise, demanded by a rapidly growing state, and in order to carry out to the people of the state the knowledge which has been gained here and elsewhere.

In making statements as to the actual amount of money needed by the university, it has been the aim to be conservative rather than otherwise. If the amounts asked for are granted, it is our confident belief that every dollar will be returned many fold to the state, even if the material point of view alone be considered.

Respectfully submitted,

CHARLES R. VAN HISE,
President.

November 1, 1908.

REPORT OF THE DEAN OF THE COLLEGE OF LETTERS AND SCIENCE

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I submit herewith my biennial report as dean of the college of letters and science.

I. CHANGES IN THE FACULTY.

The ordinary changes in the faculty, caused by the resignation of its members, especially instructors and assistants, have been numerous, as usual, and many promotions have been made; all of which are stated on another page of this report. Some of the important changes in the permanent staff may be briefly indicated here.

Professor N. M. Fenneman, who had been for four years professor of general and physiographic geology, resigned in 1907, to accept the headship of the department of geology in the University of Cincinnati. Professor Hobbs, of the department of mineralogy, had resigned the year before and his place had been filled only temporarily. In 1907 Professor Alexander N. Winchell, then professor in the University of Montana, was called as assistant professor of mineralogy and petrology and was advanced to the position of professor in 1908. Professor Fenneman's work was taken by Mr. Lawrence Martin, with the position of instructor, and his conduct of the work has been so successful that he was advanced to the position of assistant professor in the fall of 1908.

Several changes occurred at the close of the college year 1907–8. Professor D. E. Burchell, professor of business administration, resigned to accept the position of general director of the St. Paul Institute of Arts and Sciences in St. Paul, Minnesota.

Professor Stephen W. Gilman was promoted to the position of a full professor and takes his place.

At the April meeting, 1908, the regents transferred the department of home economics to the college of agriculture and, following this action, Professor Hunt and Instructor Huntington resigned their positions.

In the department of history Assistant Professor U. B. Phillips resigned to take the position of professor of American history in Tulane University, New Orleans. Mr. Richard F. Scholz, who was instructor in ancient history, also resigned to accept an assistant professorship in the University of California. In filling the vacancies thus created, Dr. William L. Westermann was called from an assistant professorship in the University of Minnesota to a similar position with us in the department of ancient history. The work in American history, formerly done by Professor Phillips, is at present in charge of instructors.

In 1907 the regents created several emeritus professorships and Professors Parkinson, Kerr, Daniells, and Parker were transferred to these positions. Each of these professors had served the university for many years, and under the arrangements made by the new professorships the institution is still able to profit by their counsels, and they take a small part in its regular work.

The appointment of Professor Kerr made little change in his position or in the work of the department, since he had held, practically though not nominally, a similar position for several years.

The change in Professor Parkinson's place made no difference in the administration of the department of political science, since Professor Reinsch had for some time been the chairman of that department.

Professor Rossetter G. Cole was appointed professor of music and director of the school of music succeeding Professor Parker. He came to us from Chicago, where he had been teaching, having formerly been professor of music and director in Iowa College, Grinnell, Iowa.

Professor Louis Kahlenberg was appointed chairman of the department of chemistry in succession to Professor Daniells, and later, when the course in chemistry was organized, was made director of that course.

In 1907 Dr. John W. Cunliffe was appointed professor of English and chairman of the department. He is a graduate of the University of London and came to us from McGill University, where he was associate professor in English language and literature.

In 1908 Dr. Max Mason, a graduate of this university and assistant professor of mathematics in Yale University, was appointed associate professor of applied mathematics. He will give instruction both in applied mathematics and mathematical physics.

The departments of pathology and pharmacology have been filled by the appointments of Professors Charles H. Bunting and A. S. Loevenhart, respectively. But as these positions belong in the college of medicine, which has now a separate organization, no further mention of them need be made here.

II. NUMBER OF STUDENTS.

The number of students registered during the period covered by this report is as follows:

	1906-7	1907-8
Graduates	160	203
Undergraduates	1,419	1,559
Total	1,579	1,762

The total number of students registered in 1905-6 was 1,579. The number, therefore, remained exactly the same the following year but the year 1907-8 gave an increase of 183—the largest increase which the college has had in a single year. The registration for the fall of 1908-9 shows that the increase for the current year will nearly equal that of the preceding year.

In the year 1907-8 the freshman class showed a large increase as compared with the preceding year; the numbers being 375 and 507 respectively. This great and unexpected enlargement caused much difficulty, as it created an unexpected demand for a considerable enlargement of the teaching force. Fortunately, the increase for the current year has been mainly in the upper classes; and the faculty, as enlarged during 1907-8, is nearly adequate for the teaching of the freshmen. Yet it is still necessary to say that in many studies the sections of freshmen in the several elementary courses are somewhat larger than we should wish, and larger than will permit the most effective teaching.

While the college of letters and science has not shown the greatest percentage of increase during the biennial period—this being true of the college of agriculture—the gain in the actual number of students has been much larger in this college than in any other.

The attendance of the summer session in 1906 was 568; in 1907, 661; and in 1908, 926. This last number does not include the engineers who were engaged in the summer course in surveying and shop work, numbering about 100.

The increase in numbers in the summer session is large and seems to promise rapid and healthy growth.

III. PROGRESS OF THE COLLEGE.

During the biennial period the progress of the college has gone on steadily, and many advances have been made in additions to the faculty of the several departments in providing facilities for teaching and for research. In addition to these changes, each of which is of comparatively small importance in itself but which are collectively of great importance in the development of the college, several larger movements have been begun or completed during the period.

The most important of these larger advances is the establishment of the college of medicine, which was authorized by the legislature of 1907. The first year of instruction in this college was offered during the year 1907–8, and with the opening of the current academic year two full years of instruction are provided. This completes the organization of the college as contemplated at present. When the college was established Professor Charles R. Bardeen was appointed dean, and his report presents all the essential matters relating to it. It is not necessary, therefore, for me to make further reference to this matter, which up to the organization of the college, occupied much of my attention and which I have more than once discussed in biennial reports. I may be permitted, however, to express the personal pleasure which I feel in seeing the completion of a movement looking toward the improvement of medical education for which I began to work in 1880, and which has taken a considerable share of my efforts since that time.

A second important movement which has been begun during the period covered by this report is the establishment of the course in chemistry. This measure is one which has been under contemplation for several years but which the cramped quarters of the old chemical laboratory made impossible. After the erection of the present chemical laboratory, however, the movement was taken up as soon as practicable. The university has long offered extended courses in chemistry in several colleges and in many departments. Advanced work in chemistry has long been done in the college of agriculture in more than one direction, and the same is true of the college of engineering. The establishment of the hygienic laboratory and the close connection of the chemical work of the State Food and Dairy commission with the university give still other opportunities for chemical work. The course in chemistry aims to bring together and to correlate definitely the various lines of chemical teaching and research in the university, and to direct them for the purpose of preparing students for professional work as chemists. Six courses of study have been outlined; a general course in chemistry, and special courses leading to the profession of chemist in agriculture, soils, physiology, food and sanitation, and in various other lines. The general course is intended for students who intend to become analytical chemists. Each course occupies four years and requires about the same number of hours of study as do the courses in engineering. They are all of professional rather than general character. The courses were established in the spring of 1908 and were first opened in the year 1908–9. About 39 students have registered for these courses, many being transferred from other departments of the university.

The great and increasing demand for chemists in many directions of industry and of social administration makes it certain that this course will meet a public demand, and the increasing dependence of modern life in many directions upon the activities of the chemist make it certain that this demand will be a permanent one.

Another movement and one of even greater importance than the establishment of the chemistry course is that which has resulted in the establishment of the courses for the training of teachers. Unlike the chemistry course these offered, and still offer, educational problems of considerable difficulty, and problems which have engaged the careful attention of the faculty for a considerable time, and especially during the last two years. The difficulties attending the establishment of such a course lie partly in the situation of the school system, and partly in the relation of the preparation of teachers to other duties of the university.

During the past few years the development of the high schools has been a very rapid one. Not only has their work increased as preparatory schools to the various higher institutions of learning to which their students go, but their immediate duties toward the community have enlarged even more rapidly. This fact is evidenced by the establishment of commercial courses and by similar movements. The oft-repeated phrase that "the high school is the people's college" is a popular indication of the development to which I refer. This rapid development has created a demand for more numerous and for better trained teachers, and during the past decade it has become increasingly plain that the high schools stand in need of teachers who have had a college training, and indeed, I would rather say, of teachers whose training has extended considerably beyond the undergraduate period. With this rising demand, however, there has not gone corresponding increase in pay, and rise of the salaries of high school teachers has not at all kept pace with the increasing demand for better preparation. Partly as a result of this fact it is still true that the professional life of the teacher is a brief one. One quarter, if not more, of the teachers in the Wisconsin high schools are new each year, so that the average professional life of the high school teacher can hardly exceed four years. This seems to be equally true of teachers coming from normal schools and colleges. This short professional life is due to more than one cause. In small part it is occasioned by the young man taking up teaching in the interval between leaving college and beginning professional studies elsewhere. This factor, while an important one in the past, is at present considerably smaller than it once was, and is decreasing as wealth and corresponding opportunities for continuous study increase. The second and more permanent occasion for this situation lies in the employment of many young women for teachers who naturally and rightly look upon teaching not as a permanent profession but as an occupation destined to fill the period between graduation and marriage. To this condition of temporary employment the salaries and other conditions of the high school teachers' life are adjusted.

It is evident that this situation must and will change, and that the mere necessity of furnishing a higher grade of teachers in the high schools will bring about a condition by which the staff of the secondary school teachers will become as permanent as is that of the colleges. But it is also plain that any change in this direction must be slow, and the result of a gradual evolution. It cannot be expected that one year or even several years will see any very great changes in a relation which is at present so deep-rooted in the administration of our school system.

Working under these conditions the university has a double duty to perform toward its students. It is necessary that the university should offer complete courses in professional instruction for those who would prepare themselves for the permanent work of teaching in the schools, and give a broad training to those who are looking toward administrative and supervisory positions. It is necessary also that the university recognize the more numerous body of students who come to college both to secure a liberal education and also to prepare themselves for teaching that they may play a useful part in the work of the schools as at present organized. On the one hand the university must recognize the school situation and must not place her professional demand so high that only the persons who are looking toward teaching as a permanent profession can fulfill it, and on the other hand such an amount of professional study must be required of all those persons who desire to teach that their work in the schools shall be reasonably efficient.

The preparation of persons for teaching in secondary schools thus offers difficulties of its own. It presents the questions which are common to all professional courses but whose solution in the ordinary professional school is found by no means impossible, and which would offer no fundamental difficulties if the situation with reference to the high schools were the same as in other professions. If students came to the university in numbers sufficient to supply the vacancies in the schools, looking toward teaching as a profession as they look toward medicine or engineering or chemistry, the problem would be a comparatively simple one; but so long as social conditions are such that the teachers of secondary schools are mainly recruited from those who do not expect to remain in teaching for more than from three to five years, the situation is certain to be difficult, and the solution of the problem is bound at first to be only approximate.

In establishing the courses for the training of teachers, therefore, the university has had in mind the following considerations: 1. The professional study of the high school teacher belongs preferably in the later years of the undergraduate course and much of it should, if possible, be gained by graduate study, since the four years of an undergraduate course are not sufficient for the student to obtain that knowledge of the subjects taught which the modern high school demands and the knowledge of methods which he ought to have before beginning professional work. 2. Under the present social conditions it is not practicable or advisable to require graduate work as a condition for teaching. The best temporary solution is to be found in an adjustment of the subjects to be taught and of the methods in teaching, within the undergraduate course. 3. There should be special care taken to develop the professional spirit and a sense of professional methods in those who are expecting to teach.

These ends the university has attempted to meet by the establishment of courses which were first presented in the catalogue of 1907–8. The chief features of these courses are as follows: 1. An undergraduate course and an advanced course for the training of teachers have been organized. In the former the students register at the opening of the senior year, reporting to the committee on the training of teachers the subjects which they are preparing to teach, and submitting their courses of study for approval. The students' course must include the required work in the department of education, which has been somewhat increased. Opportunities are also given for observation in the Madison high school and in the grades, and limited opportunities for practice teaching are also afforded in the university.

The advanced course for the training of teachers requires at least twelve semester hours of approved special studies beyond that required by the undergraduate course. These requirements may be absolved by one semester of graduate study, or during two summer sessions of the university. Provision is made for the admission of undergraduate students to this work during the summer session following the completion of the junior year. It is therefore possible for the student, by attending this summer session and that immediately following graduation, to secure the educational work necessary for the advanced course before beginning teaching in the fall following graduation. On the successful completion of this course the student receives a special certificate of fitness. This arrangement, by which twelve hours of graduate study are required and by which the work may be done in summer sessions, is regarded by the university as only temporary and the faculty would prefer to require a full year of graduate work, but recognize the fact that this cannot be demanded at present.

2. Much attention has been given to the character and the development of the courses in the university intended for teachers. In many departments these have been placed in the charge of members of the regular staff of the university who are especially adapted to this work. In other departments special teachers are provided. In the department of English at present the university aids in the maintenance of a special teacher, Mr. Bassett, who is in charge of the department of English in the Madison high school, and for this service receives a part of his salary from the Madison school board, and who also is in immediate charge of the work of training of intending teachers of English in the high schools, and who gives the special course in that department. In history Mr. Chase, formerly in charge of the Morgan Park Academy, Chicago, has been engaged for the same purpose, although his relations to the schools and the department are somewhat different. Mr. Chase will devote a considerable part of his time during the first semester to visiting and inspecting the high schools of the state with special reference to the departments in which his work lies, and during the second semester will be in charge of the course for the training of teachers in history.

In the department of Latin arrangements similar to those with Mr. Bassett have been made with Mr. W. S. Shannahan, by which he is to teach Latin in the Madison high school and to aid also in the preparation of those who intend to teach Latin in the secondary schools of the state. It is the purpose of the university ultimately to provide similar members of the faculty for instruction in all of the departments which are largely represented in high school work.

3. The several departments of the university which give in-

struction in subjects represented in secondary instruction have arranged their courses of study with careful regard for those who intend to teach.

4. The course for the training of teachers has been placed in the care of a special committee of the faculty of which Professor E. C. Elliott is chairman and which is especially charged with the duty of overseeing this course and working out its development.

The university by no means feels that the organization of the course for the training of teachers is complete. On the contrary it sees that much still remains to be done before its organization is finished. Many experiments will be tried before completely successful methods in all directions have been worked out. The faculty believe, however, that the solution of the problem of furnishing suitably trained teachers for the secondary schools has been largely advanced, and they believe also that the methods which the university is following, though perhaps not as spectacular as those which have been employed by some other institutions, are more likely to lead to permanent good results and to ultimate success.

A fourth movement of importance during the past two years is the establishment of a coöperative arrangement between the state library school and the university, by which a student may secure, during the undergraduate course, the technical training necessary to the administration of a library. Arrangements have been made by which the work of the year course given by the library school may be divided between the junior and senior years of the undergraduate course. Credit toward graduation to the amount of twenty hours will be given by the university for this work. On the completion of the course, the student will receive the bachelor's degree from the university and the graduating diploma of the library school. This arrangement is important, not so much as affecting at once any very large number of students, but as indicating the beginning of the policy on the part of the university by which young women may be educated for another profession than that of teaching. The course, whose details will be found in the catalogue of 1907-8, is offered for the first time in the fall of 1908.

The course is in charge of a committee of the faculty, of which Dr. Cunliffe, professor of English, is chairman, and on which the library school is represented by Miss Hazeltine, the preceptor.

Apart from these larger and more conspicuous movements certain other matters may be mentioned in which the educational methods of the university have made progress. The problem of the instruction of elementary students is one which is always before us and constant experiments are made in the hope of reaching a better solution of the difficulties which it presents. These experiments are necessarily on a small scale and are inconspicuous, but the total amount of time and attention given to them is very great and probably exceeds that devoted by us to any other educational question. During the biennial period reported upon distinct progress has been made in various directions. The teaching force of the college has been augmented so that the sections under the charge of the several instructors are somewhat smaller. To this matter I have referred in former reports, and need only mention it at present. This part of the problem would be more readily solved were it not for the constant increase in the number of students, which often exceeds our calculations and throws our plans into more or less confusion. The solution of the problem of small sections meets with difficulties not only in the need for more teachers but also in the increasing demands which they make upon recitation rooms. This difficulty is further augmented by the conservative character of the habits of the students, which can be modified only with great difficulty if at all. Changes in the habits of work of the faculty, in great part associated with the attempts to improve the quality of elementary teaching, still further increase the difficulties of space. The great enlargement in the number of recitation rooms for the literary departments, afforded by the completion of the north wing of university hall, has given only a partial relief to our crowded condition. This has arisen in part from the increase in the number of sections of elementary classes; in part, also, from the fact that the members of the faculty of the departments of literature and the humanities spend a much larger portion of their time at the university than was the case years ago, and need, therefore, much greater accommodations in the way of office room and similar opportunities for meeting students. Not many years have passed since it was the habit of the teacher in language or mathematics to come to the university for recitations only, having his office and study in his own house. At present the tendency is rapidly growing for the teacher in these departments to spend most of the day in the university buildings, as do the members of the faculty in the scientific departments, thus carrying on their study and research on the university grounds and in such relations to the students that they are much more accessible for counsel. The desire of the student also to recite during the morning hours so far as possible, and to save the afternoons for consecutive reading, writing, and laboratory work, also makes it difficult to spread the classes evenly throughout the day. The same difficulty attends the attempt to utilize Saturday for recitations to the same extent as other days. This tendency on the part of the students, while not wholly justifiable, is nevertheless not without some foundation in reason.

During the biennial period much progress has been made in arranging for regular conferences between members of the teaching staff in the departments of the humanities and of the students under their care. This has brought about a closer relation between students and faculty, and has tended greatly to improve the work of the students, especially of those who were less well prepared for the university courses. Among other departments in which this work has been organized I might mention that of mathematics, in which regular personal conferences are provided for between the students in the elementary courses and their instructors, and that of Latin in which the assistants regularly meet the students in beginning classes and discuss with them the difficulties of their work.

The university should afford larger opportunities for efforts of this sort, which are rapidly becoming a regular feature of university instruction. In my judgment they should be greatly extended in certain departments. The type of teaching and of study in history and literature has changed greatly within the past few years, passing from courses whose essential parts were lectures and the study of textbooks to those in which reading and the preparation of notes are the essential thing. This reading is done by the students mainly in the general library and at their own rooms. It will undoubtedly be necessary to organize this work on a basis not widely different from that on which laboratory work is carried on in the several sciences. The university will find it necessary to provide special rooms in the charge of instructors, where the students in the elementary classes may do this reading at definite times under the advice of teachers who are familiar with the subject. They will thus acquire the art of reading and note-taking under guidance, a process which is quite as necessary for the rapid and successful acquirement of this art as is the guidance of the laboratory to those who are endeavoring to learn how to work out the problems of a science by the experimental method.

IV. NEEDS OF THE COLLEGE.

It is hardly possible to make a sharp distinction between matters which are discussed under this head and those spoken of in the former paragraphs, since the subjects are very closely related. During the past two years the college has come into possession of the north wing of university hall, whose lecture rooms and offices have added greatly to the facilities for instruction. In some small degree also the new wing has relieved the pressure for space in science hall, since the department of psychology has been removed from that building, in which it was housed for nearly twenty years, and the space thus made free has been available for the department of physics. In spite of this increase, however, the development of the college keeps it constantly cramped for room. In my last report I mentioned the great improvement which had come from the remodeling of north hall for the use of the department of German and the course in commerce. In the course of two years the growth of both these departments has been such that the building is already overcrowded, and recitations which would naturally belong there have had to be taken from it for want of space.

A second need which was mentioned in my last report, that of a building for the use of women of the university, is now being met by the erection of the women's building.

I must continue to place first among the material needs of the university the building whose necessity I urged both in my last biennial report and in the one which preceded it, namely, the biological building. Two years ago I stated that if the biology department were to remain in science hall, it would be necessary to remove all of the specimens and cases from the museum, putting them on the attic floor, and using the museum for laboratories. This has been done, but only a small relief for the crowded condition of the building has thus been gained. At the present time the elementary class in biology numbers 160 students. The large lecture room for this department was intended to accommodate only a hundred students, and its crowded condition may be readily imagined. The growth of these departments imperatively demands more space. The need is greatly increased by the organization of the college of medicine whose departments are now housed in the attics and odd corners of various buildings where available space for each could be found. It should be clearly understood also that the erection of the biological building is not only a necessity for the departments immediately concerned, but that it will relieve the crowded condition of other departments in a way that no other building could effect. If the biological departments can be removed from science hall, the departments of physics and geology, both of which are now greatly cramped for room, will have sufficient space for several years. If the departments of physiology and pharmacology could be removed from the chemical engineering building, the engineering departments would also receive very much needed space. If it were possible to erect a building large enough to remove bacteriology and pathology from south hall, the literary departments would thereby receive space which could be utilized to very good advantage. The crowded condition of the latter departments is not so conspicuous at the present moment, but when it is considered that at the best this building is not likely to be ready for two years in the future, and that the college seems to be growing at the rate of 150 to 200 students per annum, it will be seen that the present quarters of the college are likely to be much overcrowded before the building can be completed. It must also be considered that all additions to the lower classes of the colleges of agriculture and engineering are in reality additions to the college of letters and science. All of the teaching in languages, mathematics, and science, occupying the greater part of the freshman and sophomore years of these courses, is done by the faculty of the college of letters and science and in the rooms assigned to that college.

In my judgment, therefore, the first material necessity of the college is the erection of a biological building which shall be large enough to contain the departments of zoology and botany and also those medical departments which are now housed in the chemical engineering building. Still further, the building should either be large enough to contain the other medical departments, or it should be so planned as to be easily enlarged, and the university should expect to make such enlargement not at some indefinite period but in the immediate future, since the removal of the medical departments from the present quarters will not only be a necessity for their development but will give to other departments of the university the space which will rapidly come to be an imperative necessity. I am forecasting the needs of the college in the years just before us as well as those now existing, and it should be clearly understood that the first and pressing necessity both for the departments most immediately concerned and for the rest of the college, is the erection of a building adequate for the purposes of the departments of zoology and botany, with the resulting removal of those departments from science hall, and the enlargement of the space given to physics and geology.

The plans for this building should also include a small building, placed on the lake, which can be used for the study of the life of the lake. The university has done much work upon the lakes, but has never had quarters properly equipped for this purpose. The erection of the biological building affords the opportunity to provide such quarters, and the university ought to regard it as one of its first duties to fully utilize the unique opportunities which it possesses for study and teaching in this direction.

The biological building is by far the most important material need of the college, so necessary to the departments immediately concerned and also to the welfare of many other departments of the college that I shall not mention any other need of the kind. The college's educational needs are, as always, many and varied; at the head of these stand those numerous matters, each small, but collectively great, of which mention cannot be made in such a report as this. The necessities for the maintenance of a large college in a state of high efficiency are not widely different from those which are required for the similar maintenance of a large and rapidly growing business. The college must have means for the enlargement of the departments at certain points, where necessity shows that enlargement is required; and for advanced salaries, both in the natural order of promotion and in special cases for the retention of especially good teachers. Great care must be taken that the increase in the number of students does not injure the efficiency of the college, by enlarging beyond reason the number of students assigned to each instructor. Only a small amount of money is demanded to meet any one of these necessities, but as the college increases the number of such cases also enlarges and the aggregate sum required becomes considerable. As an instance of the difficulties with which the administration of the college meets in these directions I may mention the size of the sections in the freshman courses. For the last five years the university has made a serious attempt to enable the college to reduce the size of these sections, and the faculty has been increased as rapidly as funds have permitted, with this aim in view, but the growth of the college has been such that, while something has been accomplished in this direction, it is much less than was hoped and expected, and less than ought to have been done.

Apart from these general needs, the most pressing educational necessity of the college is a considerable increase of the facilities in the course for the training of teachers. These are mentioned more in detail in the report of Professor Elliott, which I submit herewith. The university ought to be able to provide special instructors, in each of the main departments, for those who intend to become teachers in the secondary schools. This should be done by the assignment of this special duty to present members of our faculty, or by bringing in new men for this specific purpose. Both of these methods are now being tried, and the college should have funds for the rapid development of the work in whatever direction seems to be wise. The department of education should also be enlarged, corresponding to the increased teaching which the organization and growth of this course imposes upon it. Considerable educational facilities for observation and practice work must also be provided, and these will occasion and demand the expenditure of considerable sums.

It may not be improper for me to say that had the legislature of 1907 found it practicable to grant the request of the university for funds to support the medical college, the organization of the course for the training of teachers would have presented no financial difficulties. If the sums of money now devoted in the budget of the college of letters and science to those departments which are specially concerned with medical instruction could be provided from other sources, the funds of the college would be sufficient to provide for the course of the training of teachers.

Forestry is a line of instruction which the college should take up and develop as rapidly as possible. I do not see that this matter either demands or admits of argument. The establishment of the Forestry commission by the state and the declared policy of maintaining and restoring our forests and creating a forest reserve makes the subject of forestry one of the great economic subjects in the welfare of the state. All of the instruction which the university has hitherto given with reference to trees and forestry has been given in the college of letters and science, and from the nature of things the new men whose presence would be necessary for the establishment of a course in forestry would be found in this college. The greater part of the work needed for the establishment of a forestry course is already given by the university. This is true not only of the general branches of study which such a course would naturally include, but also of many technical subjects, which are already given in the college of letters and science and in the college of agriculture. Additional teachers are needed for instruction in vegetable pathology, especially the diseases of timber, and also for technical instruction in forestry. I have mentioned this subject in a former report, and need not again refer to it here beyond saying that I trust the regents will find it possible to establish at least the department of vegetable pathology in the near future.

The university museum is a department which is developed by all of the larger universities, but to which the University of Wisconsin has given almost no attention. Working collections have been provided in several departments so that the ordinary instructional work of the institution does not suffer from want of illustrative material, but no attempt has ever been made to bring together and to display collections which would be of general interest and educational value to the university and to the public. Even the small amount of space and of money which the university devoted to museums for some years after the completion of science hall has been reduced as the growth of the university has caused pressure for space and for the use of funds in other directions. The biological museum is wholly, and the geological museum partly, converted into laboratories. The report of the director of the course in commerce, which I present herewith, speaks of this matter with reference to the collections in his own department. Similar statements might be made with regard to many other departments of the university.

The university has hitherto done almost nothing in the direction of art. In his inaugural address President Van Hise referred to this matter, and expressed the intention of introducing this subject into the university program. Several times during the past five years plans have been made for the purchase of a collection of castes, or for other expenditures relative to art, but each time the necessities of supporting the work of the college already in progress have made it impossible to carry out these plans. In no direction is the college more deficient than in this. Indeed, since the college is doing nothing in this direction, a greater deficiency can hardly be imagined.

In my last report I stated that the fund for the purchase of apparatus had been considerably increased and had been enlarged to a point where the most pressing necessities of the several departments could be met. This fund has been reduced for the current year, but I trust that the reduction is only temporary, and that the full amount formerly granted will be restored. It is perhaps unnecessary to increase this fund largely at present, but the university would derive great gain from the establishment of a special fund for assistance in research. The late Colonel William F. Vilas, in his will providing for the establishment of research professorships, recognized this necessity, I think, more definitely and more fully than has ever been done before. It would be well if the university could make some practical recognition of the need. The university now regards research as one of its important duties toward the public; yet it is hardly realized how much the efficiency of research may be advanced and how greatly the results of research may be increased by small sums of money, granted for the payment of assistants in the performance of the routine work demanded by every large piece of investigation. The collating of literature, the taking of notes, the preparation of miscroscopic specimens, the carrying out of computations, are examples of the innumerable tasks which are involved in research. These can be done accurately and economically by assistants, whose aid will leave the investigator free to consider the intellectual problems involved in his subject, to correlate his material, and to prepare the results for publication. If the university could provide a fund from which sums could be granted for this purpose, very large results would be obtained in proportion to the sums thus expended. They need not be large in any individual case, perhaps from $100 to $300 or $400 annually; nor need the aggregate of such sums be considerable. There is, perhaps, no direction in which the expenditure of comparatively small sums of money promises to bring greater returns in the intellectual advancement of the institution.

Respectfully submitted,
E. A. BIRGE,
Dean, College of Letters and Science.

REPORT OF THE DIRECTOR OF THE COURSE IN COMMERCE

DEAN E. A. BIRGE,
College of Letters and Science.

SIR:—I submit herewith my report as director of the course in commerce for the biennial period 1906–8.

The attendance in the course in commerce for the year 1906–7 was 200, and for the year 1907–8, 222. The registration to date indicates a considerable increase for the present year, though exact comparisons with the corresponding date for last year cannot be given.

The following table indicates the distribution of these totals among the various classes, and makes possible a comparison with figures for each year since the organization of the course:

	Senior.	Junior.	Sophomore.	Freshman.	Special.	Total.
1900–1	....	2	17	62	4	85
1901–2	3	9	35	50	5	102
1902–3	8	25	42	63	9	147
1903–4	22	25	47	71	8	173
1904–5	20	30	57	99	13	219
1905–6	22	38	73	83	9	225
1906–7	30	35	61	69	5	200
1907–8	28	44	59	86	5	222

The number of students from other states and foreign countries was 20% of the total number in both years, a percentage which in previous years has varied from a minimum of 16 in 1901–2 to a maximum of 24 in 1904–5, the average for the eight years during which the course has been in existence being 20.6%

That the chief constituency of the course has been the class for which it was intended, namely, those who are planning for a business career, is indicated by the fact that, with the exception of a single year, 1900, the percentage of the total number who have abandoned the course in order to be transferred to other courses in the university has never reached 10%. During the last two years it was 9%. The same conclusion is indicated by the fact that nearly all the graduates of the course have gone into and remained in business, in spite of considerable pressure in some instances to enter other callings, especially the profession of teaching.

The demand for teachers of commercial subjects for high schools and colleges has been very great and is constantly increasing, and I have endeavored to meet it by urging students in the course who seemed to me to be fitted for that kind of work to prepare for it. I have succeeded to the extent of supplying one teacher from the class of 1907 and five from last year's class.

In my opinion the time has arrived for some modification in the four year course. Since 1904–5 students in this course have been required to take business administration from the beginning of the sophomore to the end of the senior year in addition to the 120 fifths required for the bachelor's degree, and no other students have been permitted to elect any part of this work and count it towards the 120 hours required for graduation. This arrangement was considered best four years ago, partly because of the undeveloped and experimental character of the subject, and partly because it was considered good policy to require more work from students in the commerce course than from those in the general course of the college of letters and science. Conditions have now changed in important particulars. The work in accounting, which constitutes the major part of the course in business administration, has now been well developed and organized and arranged into an elementary and preparatory course for sophomores entitled "The Elements of Accounting," a junior course, entitled "The Theory and Practice of Accounting," to which the preceding is a prerequisite, and an advanced course for seniors, to which the two preceding are prerequisite, entitled "Advanced Accounting and Auditing." In my opinion and in that of my colleagues, credits for the two latter courses should be counted toward the 120 hours required for the A. B. degree, and these courses thrown open on these terms to election by all students of suitable preparation.

This change would permit the introduction into the business administration work, not to be counted toward the 120 hours for graduation, of courses in commercial correspondence and commercial arithmetic, subjects in which our students are very deficient and in which it is hopeless to expect adequate preparation in high schools under the present requirements of admission to the university, and would permit us further to extend our experimental work in new fields of commercial education.

During the last and the present academic years it has been found desirable to modify somewhat the group system previously required in this course. Some of the requirements in the old groups proved to be too rigid and new needs appeared. Groups are now arranged each year to meet so far as possible the needs and desires of students, and to furnish suitable preparation for the theses required for graduation. Most of the groups arranged fall in the field of economics, but some of them combine courses in economics and political science, and in some cases economics with courses in still other fields. The aim in every case is to secure a well correlated group, which will give preparation for a thesis and meet the professional needs of the individual student, so far as the resources of the university permit.

Since the establishment of this course, the director and other members of the staff have considered it an important part of their work to study the kind and the direction of the training which modern conditions demand of those who are to enter upon business careers in the field of general commerce. To this end we have undertaken two lines of investigation, one pertaining to the actual organization and educational problems of typical concerns in various branches of commerce, and the other to the educational work actually carried on at the present time by business houses for the training of their employes. During the last two or three years these investigations were conducted chiefly through Professor Burchell, who exhibited some unusual qualifications for that kind of work. His resignation has necessitated the temporary cessation of work along these lines, as well as of the experimentation here with the materials thus obtained. This is particularly to be regretted, because many valuable connections which he formed and which promised large returns, will necessarily be lost and much of the work must be started anew when a suitable person for doing it is found. I trust that such a person may appear, and may be brought into our service very soon. If the solution of the problems of commercial education is ever found, it will come through investigations of this kind, and I have cherished the hope that this institution might continue to be, as it has been in the past, the leader in this work.

During the last two years we have added considerable valuable material to our commercial museum. We now have a fairly satisfactory collection of raw materials, illustrative of our domestic resources and industries, and some foreign materials which compete with our own. Gaps here and there need to be filled as rapidly as possible. In collecting foreign materials it has been our policy to procure only those things that are strange to our students, and peculiar, and which it is not easy for them to understand without actual sight or touch. Our collection of this sort of material is fairly complete for the Philippine Islands, but we have little or nothing from our other island possessions. We would like to add various raw materials from Guam, the Hawaiian Islands, Cuba and Porto Rico, and from various foreign countries. The Japanese government is making a collection for us, which we shall receive on payment simply of the freight charges. Collections from other countries could doubtless be obtained at a correspondingly low cost.

It has not been our policy to duplicate materials found in other museums of the university, and we would like to have such materials made available for the use of our students, particularly minerals of commercial importance in the geological museum.

The further development of our museum is rendered difficult, if not impossible, by the lack of space for expansion. We already have a considerable collection of commercial forms and documents which we are unable to exhibit for lack of space, and we would like greatly to increase this collection. For the same reason we are also prevented from exhibiting for the benefit of our students appliances, apparatus and labor-saving devices of various sorts, which could be obtained for the asking from the firms manufacturing them.

Inasmuch as the collection of a museum is in the nature of the case a gradual process, I trust that space and funds may be forthcoming for the continuation of the work.

Respectfully submitted,

W. A. SCOTT,

Director.

REPORT OF THE DIRECTOR OF THE CHEMISTRY COURSE

DEAN E. A. BIRGE,
College of Letters and Science.

DEAR SIR:—I am sending you herewith the statement which you have requested concerning the establishment of the chemistry course. The course was recommended by the faculty and established by the regents in 1908, to meet the demand for well trained chemists which has greatly increased in recent years. Not only has there been a greater call for teachers of chemistry for high schools, colleges and universities, but a great demand has arisen for chemists of ability for agricultural experiment stations, hygienic laboratories, health and sanitary departments of cities, food testing laboratories, and various industries engaged in the manufacture of foods, textile fabrics, metallurgical products and building materials. These numerous and increasing calls were the occasion of founding the chemistry course, which consists of four years of work leading to the degree of bachelor of science, chemistry course.

It is not the purpose of the course to prepare men for each individual industry, for that would be well-nigh impossible, since it requires special practical experience to become proficient in any special line of work. The aim is rather to train the student in the fundamental principles of chemistry and the closely allied sciences. To do this successfully requires, also, a sufficient knowledge of mathematics, and the ability to read French and German. Equipped with such training, the student can readily adapt himself to any special line of work in which he might later engage.

The chemistry course has been outlined in form of six courses of study, namely, a general course, a course for industrial chemist, a course for agricultural chemist, a course for soil chemist, a course for physiological chemist, and a course for food chemist. The last course is also adapted for those that desire to fit themselves for sanitary and hygienic laboratories. The first two courses are relatively free from biological studies, containing a short course in bacteriology, which it is highly desirable for every chemist to have. The other four courses contain a considerable amount of biological work.

Though the work of these courses lies largely in the college of letters and science, a fair share of the more advanced and specialized studies is given in the college of engineering and in the college of agriculture. Indeed, the presence of the latter colleges at the university has made it possible to offer here a much stronger course for the training of chemists than would otherwise have been possible.

In arranging the chemistry course an opportunity for elective studies outside of the special fields of work actually required has been maintained as far as possible, so that the training of the student might not be narrowed by pursuing highly specialized lines of work exclusively. It is further hoped that a fair share of those that complete the chemistry course will later avail themselves of the graduate courses in chemistry which the university offers, in order to further perfect their training. The fact that at the opening of the chemistry course eighteen freshmen and nineteen sophomores, juniors, and seniors have enrolled in this course, and that among these there are some from distant states, would indicate that in establishing the chemistry course the university has undertaken a work useful and, indeed, necessary to society.

Yours very truly,

L. KAHLENBERG,

Director.

September 8, 1908.

REPORT OF THE DIRECTOR OF THE COURSE IN PHARMACY

DEAN E. A. BIRGE,
College of Letters and Science.

SIR:—In order to understand the recent unsatisfactory condition of the pharmacy course, so far as numbers are concerned, it is necessary to study the general condition of the so-called drug business during the past decade. Not only did the druggist suffer with other business men at the time of the depression in 1898, but the war taxes proved more of a hardship to him than possibly to any other calling because of the tax on proprietaries, the largest burden of which had to be borne by the retail druggist. Instead of realizing a profit of the proverbial one hundred per cent, the average druggist, we are told by those who have studied the situation, had to be satisfied with a gross return of less than 20 per cent on his investment.

Of all lines of business, the drug business has been reported as the slowest to recuperate. The result—a very fortunate one under the circumstances—was that but few young men went into the drug business. Indeed, not a few drug clerks left their chosen calling and sought more remunerative positions elsewhere. Such was the scarcity of drug clerks for a number of years, that every attempt on the part of the state boards of pharmacy to raise the educational status of the candidates for registration met with determined opposition on the part of druggists everywhere.

A change in this situation, in so far as Wisconsin is concerned, was first noticed by our board of pharmacy at its Madison meeting in April, 1908. Not only was the class that presented itself for examination much larger than it had been for years, but this class contained candidates rather advanced in age, men who had not been in drug stores for five and ten years but who were now returning to the calling of their first choice.

That the pharmacy course should benefit numerically by this change for the better was possibly to be expected. The registration of new students at the opening of the present semester is more than again as large as it was last year.

What is more gratifying, however, than this increase in numbers, is the constant improvement that has been going on in the character of the students seeking admission. When the writer took charge of the pharmacy course, out of a class of forty-two new students admitted by him, only twelve graduated two years later. Not a few of the applicants in those days had not even been through the grammar grades of our public schools. At present most of the junior students of the two year course are high school graduates. As a result of the policy favoring quality rather than numbers, the pharmaceutical graduate of the University of Wisconsin is forging to the front more and more. That this policy, although repeatedly and severely criticized, has justified itself, results have demonstrated.

For several years the state board of pharmacy has been holding two of the four examinations given annually in the pharmaceutical laboratories. Although the lack of a special equipment for this work is being felt more and more as the board is striving to make its examinations more practical and thorough, this relation between state board and university is certainly proving to be for the good of pharmacy in our state. Other lines of cooperation have been agreed upon, but it is too early to discuss probable results.

A most gratifying termination of the biennium just closed was the bestowal last commencement, of the honorary degree of doctor of laws by the university upon Dr. F. B. Power who had been elected to the first professorship of pharmacy twenty-five years ago. In the present freshman class of the university, there is a son of a member of the first pharmacy class that entered the university in the fall of 1883.

Because of his work in plant chemistry, the writer has been invited on several occasions to cooperate with the bureau of plant industry of the department of agriculture. In accordance with an agreement made between the university and the secretary of agriculture, the writer was granted a leave of absence for the first half of the academic year 1907–8, for the purpose of studying abroad the problems pertaining to the subject of industrial alcohol. As a further result of this agreement, work is being done for and by the national government in the writer's laboratory.

For many years the writer has been desirous of having medicinal plants cultivated on the campus, but was unable to secure proper cooperation with other departments. Having gone ahead on his own initiative last summer, the department of agriculture at Washington has expressed its satisfaction with the work to the extent of supplying a student assistant, for the purpose of working up the material raised during the past season. Indeed, further cooperation and support is in sight if the state and the university will but do their share to further this important work.

As a result of the satisfaction given by our graduates in Washington, the demand by government bureaus for plant chemists with pharmaceutical training has been much greater than our supply.

Since 1890 the university has been called upon to do its share of work for the revision of the United States Pharmacopoeia, Dr. Power having been elected a member of the revision committee in 1890, and the writer at the Pharmacopoeial Convention in 1900. The work of the revision of the volatile oil text of the United States Pharmacopoeia for 1910 was begun this summer with the cooperation of Professor Brandel, one of the graduates of the course, and now assistant professor of organic chemistry at the University of Washington.

The cooperation between the university and the Dairy and Food commission has certainly proven a beneficial arrangement for the state. During the past two years the commission has given some attention to the condition of chemicals and pharmaceutical preparations on the shelves of the drug stores. If the good work recently begun can be continued, it will unquestionably prove a great benefit to the public and will assist in raising the status of pharmacy in the state. Two of the three assistants of Dr. Fischer are pharmaceutical graduates. The chemico-botanical training of the pharmacy course affords, no doubt, a good preparation for later specialization along the lines of analysis of food stuffs, beverages, drugs, and medicines.

While it may be too early to say that the pharmacy course has outlived its storm and stress period, the first quarter of a century has put the pharmacy course of the university into the very front ranks of like courses throughout the country. In spite of misgivings, frequently expressed at home, the course has advanced under most trying circumstances and, although still small in numbers, rests on a firm foundation, viz., that of twenty-five years of service to American pharmacy at large and to Badger pharmacy in particular.

Respectfully yours,
EDWARD KREMERS,
Director.

REPORT OF THE COURSE FOR THE TRAINING OF TEACHERS

DEAN E. A. BIRGE,
College of Letters and Science.

DEAR SIR:—Agreeable to your recent request, I present the accompanying general statement concerning the course for the training of teachers. Included therein will be found:

I A brief account of the development of the university work for the training of teachers during the last year.

II A short discussion of the existing status of the course for the training of teachers.

III Brief mention of certain items of importance with reference to the future development and extension of those special activities falling within the proper scope of this course.

I. DEVELOPMENT OF WORK FOR THE TRAINING OF TEACHERS.

FACULTY LEGISLATION.

The preliminary step for the reorganization of the university work for the professional training of teachers was taken at the close of the academic year of 1906–7, (May 27th) by the faculty of the college of letters and science in adopting the report of the special committee of its members, appointed to present a plan for improving the training of teachers, with special regard to the high schools of the state. The recommendations embodied in the adopted report became operative, as to students of junior or lower standing, in September, 1907. The principal immediate changes resulting therefrom were as follows:

(1) The establishment of a standing committee on the training of teachers for the more detailed oversight and administration of those matters implied by this title.

(2) The improvement and intension of the departmental teachers' courses, i. e., those courses dealing with the technique

of instruction, now given in those subjects occupying positions of major importance in the curricula of the high schools of the state.

(3) The modification of the requirements of the University Teachers' certificate, eliminating the optional courses in philosophy, increasing slightly the amount of study of education, and requiring at least one special departmental teachers' course.

(4) The considerable extension of the use of observation of teaching and practice teaching as necessary and integral parts of the plan of professional training for teachers afforded by the universtiy. Obviously such observation and practice work concerned the courses in the department of education and the several departmental teachers' courses.

CO-OPERATION WITH MADISON PUBLIC SCHOOLS.

Directly bearing upon this last item was the placing of the whole scheme of the observation of teaching upon a more definite and satisfactory basis through two formal agreements between the board of regents of the university and the board of education of the city of Madison, relative to the use of the classes in the Madison high school for observational purposes by university students.

Special High School Teachers.—By the terms of the first of these agreements, entered into in June, 1907, provision was made for the appointment, for service in the Madison high school, upon the joint nomination of the superintendent of the city schools and the president of the university, of not to exceed five especially trained, skilled, and experienced teachers, in the principal subjects of the high school curriculum. Teachers thus appointed were not to teach more than fifteen regular class periods per week, and their classes were to be open for special visitation and observational study by university students under such conditions as might be formulated by the university, in conference with the superintendent of city schools and the principal of the high school. In addition, these teachers were to cooperate with the respective university instructors in the giving of the special departmental teachers' courses, and also with the instructors of the department of education in the courses within that department.

In consideration of the privileges granted, it was stipulated that the regents of the university should pay two-thirds, and the board of education one-third, of the amount of the annual salary of each teacher appointed, and employed under the terms of the agreement.

It was informally understood at the time of the adoption of the agreement that only such of the special appointments would be attempted as were possible in the regular course of changes taking place in the corps of high school teachers. For the past school year it was found possible to secure the appointment of but one of the above mentioned special teachers. Mr. H. K. Bassett, a graduate of the Teachers College, Columbia University, and later a special teacher of English in the Ethical Culture School of New York City, was appointed as teacher of English in the high school by the board of education and at the same time was appointed lecturer in education within the university.

At the opening of the university year it was found possible to utilize directly the services of Mr. Bassett for the professional work within the university, and consequently, in addition to his work as a teacher in charge of the high school classes open to observation by students of the university, he has had charge, in conjunction with Professor Bleyer, of the special teachers' course within the department of English of the university.

Cooperation with Regular High School Teachers.—It was clearly recognized that the appointment of the total number of special teachers provided for in the agreement would be reached only after two or three years, without disturbing unnecessarily the existing force of the high school. In order, however, to afford as wide an opportunity as possible to the university students to study the practical work of the high school, this first agreement included a provision for the designation of certain of the regularly employed high school teachers whose classes also were to be open for visitation and observation by university students, and who were to render such assistance to the several university instructors as was found possible, to the end that the visitation and observational work might be made most serviceable and profitable. It was further provided that such teachers were to receive an honorarium of $10 for each and every month during which the specified extra service was satisfactorily rendered. In accordance with the terms of this second portion of the agreement, eight regular high school teachers were designated for the cooperative service during the seven months beginning November 1, 1907, and ending June 1, 1908. Previous to their designation, an informal conference was held with these teachers and the purpose, character, and demands of the plan were fully explained. The teachers themselves were left entirely free to accept or decline the proffered position within the cooperative plan. It is worthy of note that no one of them declined and that all of those designated continued until the close of the year to perform satisfactorily the duties imposed.

The introduction of the principle of compensation to these regularly employed teachers reacted in a very marked way to increase the sense of their responsibility and the quality of their interest, as well as the extent of their service and assistance to our students.

Throughout the whole course of the negotiation, the attitude of the board of education, the superintendent of schools, and the principal of the high school has been one of genuine interest in the success of the plan.

Results of Cooperation.—While not without its obvious limitations and difficulties, it is, I think, the general opinion of both students and university instructors that this plan of definite cooperation with the high school has been productive of a very positive result, and has served to increase very largely the interest of students in their professional work in preparation for teaching.

Some little apprehension was entertained at first by the members of the board of education by reason of possible interference with, and interruption of, the work of the high school classes on account of the continued visitation of any large number of university students. So far as I have been able to learn, after rather careful inquiry, the observational and visitation work was carried on throughout the year without criticism or objection from parent, pupil or teacher. This certainly presents some conclusive evidence of the patience and helpfulness of the high school teachers themselves, and also of the tact and earnestness of the university students concerned. More significant does this absence of any friction become when it is recalled that this whole plan was carried out under the abnormal stress occasioned by the conduct of the high school classes in temporary and scattered quarters.

In the absence of an organized secondary school under the complete control and direction of the university, I am of the opinion that this plan of cooperation with the Madison high school is a very serviceable expedient to provide a minimum of laboratory experience for our intending-teacher students.

Amount of High School Visitation and Observation.—During the six months of the operation of the plan approximately twenty-two hundred visitations were made by three hundred eighty students in the university departments of Latin, English, German, history and education. With the opening of the new high school building in September a much wider and better opportunity will be afforded for the successful operation of the plan of cooperation.

Observation in Madison Elementary Schools.—In order to meet certain definite needs of the department of education, and after several months' experience with the operation of the provisions of the first agreement, the principle of cooperation with the high school was extended in December, 1907, by a second formal agreement between the board of regents of the university and the board of education of the city of Madison, so as to include certain of the elementary schools of the city. In brief, the terms of the second agreement were similar to the second portion of the agreement relative to the high school. Certain of the regularly employed teachers in the elementary schools were designated, whose classes were to be open for visitation and observation by university students. Such teachers were to receive an honorarium of $5 per month for each and every month during which the specified services were satisfactorily rendered. Under the agreement, the appointment of twenty-two elementary school teachers in the George Washington school, the Lyman C. Draper school, and the Washington Irving school, was approved by the executive committee of the board of regents on January 27, 1908. These teachers were to retain their cooperative relation to the university until June 1, 1908.

Previous to the inauguration of the plan of visitation in the elementary schools, a conference was held with all of the teachers in the schools mentioned, and the details of the proposed plan fully and frankly discussed. No pressure was brought to bear upon any teacher to accept the conditions of the plan. All did accept, however, and all, with one exception occasioned by withdrawal on account of illness, continued until the close of the year to perform in a satisfactory manner the duties devolving upon them.

As with the high school, this plan of cooperation resulted in mutual benefit both to the schools and to the university. The principle of compensation was regarded as not only just to those teachers to whom any such plan meant considerable extra work and effort, but also essential to the effectiveness of the plan. The expense to the university was trifling in comparison with the wider opportunities opened to instructors and students in the department of education for the objectifying and vitalizing of the university class room instruction. Notwithstanding the shortness of the time during which this portion of the plan was in operation, approximately six hundred periods of visitation were held by one hundred fifty students in second semester classes of the department of education.

COMMITTEE ON THE TRAINING OF TEACHERS.

At the opening of the academic year, 1907–8, the administrative committee on the training of teachers, as provided for by the action of the faculty of the college of letters and science in May, preceding, was designated. This committee, consisting of yourself, as dean of the college of letters and science, and the representatives of the departments of education, English, German, botany, chemistry, history, philosophy, Latin and mathematics, met on October 21, 1907, adopted a provisional plan of organization, and began the work of carrying out, so far as its restricted powers permitted, the expressed desire of the faculty for the stimulation of the work for the training of teachers.

Supervision of Observation Work.—The first efforts of the committee were directed toward the organization and supervision of the plan of visitation and observational work in the Madison high school instituted under the terms of the first agreement between the board of regents and the board of education. Mr. Bassett was made the secretary of the committee in order that the members might be kept in close touch with the practical situation of affairs in the high school. The initial experience with the plan pointed out the immediate necessity of clerical assistance, in order that students doing the visitation and observational work might be properly assigned in accordance with needs of the courses concerned and effectively distributed so as to reduce to a minimum the possible interference with the high school classes. Such assistance was provided beginning January 1, 1907, and resulted in bringing about the desired order and oversight.

Requirements for Departmental Teachers' Courses.—Early in its discussions, the committee was led to the necessity of formulating certain standards for the departmental teachers' courses in order that such courses might fulfill the purpose intended when they were placed within the distinctly professional group of courses to be taken by intending teachers. It was felt necessary that such courses should be clearly distinguished as to aim, content, and method from the usual academic or subject matter courses and also that there should be a certain degree of uniformity among them, at least from a quantitative point of view. To this end the committee established the following provisional standard for suggestion to departments:

> "A departmental teachers' course is one especially adapted to the professional needs of those preparing to teach. Such a course (a) shall be at least two hours for one semester in length; (b) shall place its chief emphasis upon the scope and methods of the specific subject matter normally included within the curriculum of the high school; (c) shall include the observation of teaching in the high school to the minimum amount of twelve periods, such observational work to be conducted in such a way as will best exemplify the content of the university course; (d) shall be open preferably to students of senior or graduate standing, it being understood that such students shall have previously completed a prescribed minimum in kind and amount of courses within the department; (e) shall be counted in partial fulfillment of departmental requirements as to the maximum number of credits for a major."

With the exception of the several departments of science, these standards have been generally accepted by those university departments most directly concerned in maintaining special teachers' courses, and in the academic year, 1908–9, departmental teachers' courses will be introduced in the sciences taught in the high school. Those in immediate charge of the departmental teachers' courses have made earnest efforts to organize and develop these courses so that they will possess genuine professional worth to the student. The opportunities offered for observational work within the high school have been taken advantage of by the departments of English, Latin, German and history. The departments of German, French and history have also provided a certain amount of practice teaching for a limited number of students within the elementary courses of the department.

From one point of view the development and increase in dignity and worth of these departmental professional courses has been one of the noteworthy events of the year.

II. ORGANIZATION AND STATUS OF THE COURSE FOR THE TRAINING OF TEACHERS.

In view of the increasing complex situation confronting the university as regards its function in the preparation of teachers for the high schools of the state, the committee on the training of teachers set about to propose a more definite organization of the professional work for the training of teachers. After no inconsiderable effort, the committee prepared and presented to the faculty of the college of letters and science, a plan for the organization of a course for the training of teachers. This plan was considered at the meeting of the faculty on February 17, 1908, and adopted. Shortly afterwards, the action of this faculty was approved by the board of regents.

The course, as adopted, has been presented in the 1907–8 university catalogue. In brief, its chief features are as follows:

Undergraduate Course.—The organization of an undergraduate course for the training of teachers, requiring:

(a) Definite registration of students at the beginning of the senior year.

(b) An approved selection of the subject, or subjects, preparation for the teaching of which is contemplated. Such subjects are classified as major and minor subjects.

(c) The fulfillment of definite requirements, as laid down by the respective departments, in order to qualify for teaching a subject either as a major or minor.

(d) The fulfillment of the special requirements for the University Teachers' certificate.

Advanced Course.—The establishment of an advanced course for the training of teachers, requiring:

(a) Twelve semester hours of approved special study beyond that required by the undergraduate course.

(b) The joint recommendations of professional "fitness" for teaching by the department of education and the other department or departments concerned.

These requirements of the advanced course may be completed in one semester of graduate study, or during two summer sessions. Special provision is also made for the admission of undergraduate students during the summer session following the completion of the work of the junior year.

Advanced Certificate.—In the absence of any definite legal recognition by the state of such advanced professional preparation the regents of the university established a special professional certificate to be awarded to those completing the work of the advanced course.

Administration.—For the purposes of its general administration the course is to be placed in charge of a director and a standing committee. This committee is to consist of seven members from the faculty of the college of letters and science, representing the departments concerned, and is also to include a representative from the committee on accredited schools and appointments. Provision is also made for the addition of the representatives of the departments of other colleges which may be concerned with the training of teachers.

Special Lecturers.—In order that the course for the training of teachers might be maintained and developed in closer relations with the practical educational interests of the state, it was provided that the university should, each year, enlist the cooperation of the presidents and professors of the state normal schools, superintendents, principals and others engaged in the educational work of the state. Owing to the lateness of the year it was not found possible to carry this provision into effect as fully as was generally desired. Nevertheless, the following city superintendents of schools came to the university and gave one or two lectures, each, on some one of the practical aspects of teaching before the various groups of students, preparing to teach: Superintendent H. C. Buell, of Janesville; Superintendent J. H. Hooper, of Ashland; Assistant Superintendent Leo Stern, of Milwaukee; Superintendent H. S. Youker, of Grand Rapids. President John Keith, of the Oshkosh Normal School, and Principal Charles McLenagan, of the West Division High School, of Milwaukee, found it necessary to cancel their engagements as special lecturers, owing to the exigencies of their duties at the close of the school year.

This plan of cooperation with the general public school interests of the state, seems to possess wide possibilities and it is hoped during the coming year that it may be developed in a way so as fully to carry out the original intent.

Future Developments.—From the larger point of view the institution of the course for the training of teachers represents the great forward movement of the year. Inadequate and incomplete at some points, it is, nevertheless, indicative of the assumption of a positive policy toward this important matter of teacher training. The course does not become fully operative until next year, although a beginning was made with the advanced course during the past summer session. The naturally conservative attitude generally assumed by university departments insures protection from hasty and ill advised action. At the same time the present needs of the secondary schools of the state are such as to necessitate a larger forward movement by the university in the performance of its duty in preparing teachers.

III. PROPOSALS AND RECOMMENDATIONS.

I propose now to set forth briefly for your consideration certain items which seem to me to be of importance with reference to the future development and extension of the course for the training of teachers.

ADMINISTRATION.

The peculiar difficulties as to the manner of administering the affairs of such a course as the one in question are so well known to you as to make entirely unnecessary any presentation of them here. In this respect this course is radically different from the other courses organized in accordance with the prevailing university scheme. These courses are mainly concerned with instruction which falls normally within a few departments, and the students taking such courses are more or less sharply differentiated. Direction and supervision, therefore, become comparatively simple. The training of teachers, on the other hand, involves the larger number of the departments and includes a large percentage of the students of the college of letters and science. Direction and supervision of the work pertaining to the training of teachers becomes a delicate and complex matter. The erection of the administrative committee for the oversight of the course for the training of teachers was necessary, for representative and decentralized direction and supervision. With the full development of the plan, however, the director provided for should be enabled, in the proper exercise of his duties, to devote the time, and thought and energy essential for creation of a thoroughly coherent and efficient scheme.

CO-RELATION WITH COMMITTEE ON ACCREDITED SCHOOLS AND APPOINTMENTS.

In view of the existing relationships between the university and the secondary schools of the state, there would seem to be a need of establishing a much closer connection than now obtains between the committee on the training of teachers and the committee on accredited schools and appointments. In fact, when the large common element of the functions to be performed is considered, there seems to be much valid argument for almost identical membership of the committees in question. The chief counter argument, of course, is the heavy demand upon the time of certain individuals for administrative duty. Although anticipating, it may be said that for the year 1908–9 these two committees are largely composed of the same members of the faculty. In this way it is expected that there will be developed a greater unity of university effort in the maintenance of effective and harmonious relationship with the secondary school, and perhaps the entire public school interests of the state.

LABORATORY WORK IN THE TRAINING OF TEACHERS.

The position that the university should endeavor to fit teachers "ready for service" is scarcely tenable. On the other hand, the demand that the university shall go to greater lengths than it has in providing opportunities to its students to become acquainted, from a practical and empirical point of view, with the work of teaching, is not without reason. The establishment of the existing cooperative relationship with the Madison high school was calculated to meet the demand. Yet the natural limitations of this plan of cooperation are such that it will continue merely partially to supply the needs of our students.

In my opinion, the university must, in the immediate future, take such steps as will lead to the establishment of a secondary school, which will be completely under the general control of the university, and which will be wholly available for laboratory facilities for the course for the training of teachers; even though this would necessitate the rearrangement of the order in which the presumed needs of the university stand in the proposed development policy of the university administration. By placing this item among the first of these demanding immediate financial support by the state, a vast deal could be accomplished in dissipating the criticism now so freely directed toward the university for its inactivity in the matter of training teachers by the public school men of the state. This argument alone, would, however, scarcely be sufficient justification for such an establishment. For the plan in question must be regarded, in spite of the manifold difficulties in the way of its successful operation, as one of the most direct means for unifying and raising the standard of the whole system of Wisconsin high schools. In such a school the ideals of secondary education (and for that matter of elementary education, also) formulated within the university would be realized, and would exert an influence far more direct and immediate than is now possible. The arguments pro and con for a school of this type have already been presented and discussed. I merely mention the subject here as one upon which a definite stand must soon be taken.

Granting the near establishment of a university secondary school, which, to be of greatest service, should be planned so as sooner or later to be closely correlated with a university elementary school; granting the continuance of the present plan of cooperation with the Madison public schools, modified somewhat in the event of the aforesaid establishment; even then wider and more comprehensive facilities will be needed for the one hundred fifty or two hundred students, who, under the present conditions will be enrolled in the course for the training of teachers. To provide adequately for contact with and intelligent study of the actualities of the school for such a large number of students will always be difficult in the extreme. After a thorough consideration of the different elements of the problem I am led to propose the following plan, the principal features only of which I give in brief outline. I may say that I have already discussed the plan with some of the leading school men of the state, and in every instance it has been judged as being full of possibilities for the more successful and more complete training of teachers for secondary schools.

TEACHING FELLOWSHIPS.

(a) That there be established by the university a certain number of teaching fellowships, to begin with, probably forty, to be awarded according to some plan that will lead to the selection for further training of the most competent and fit of those completing the work of the undergraduate course for the training of teachers; each of the teaching fellowships to carry with it an annual honorarium of two hundred twenty-five dollars.

(b) That each of the teaching fellows be assigned to one of a class of high schools which may for convenience be designated as "cooperating high schools." Such cooperating high schools to be selected according to carefully formulated conditions from the best of the secondary schools of the state, and in sufficient number to accommodate the whole number of teaching fellows.

(c) To the teaching fellows thus assigned, approximately fifteen periods per week of regular teaching work in the school would be given, such teaching to be as far as possible under the supervision of the principal of the school, or some other properly qualified teacher; such supervision to be supplemented by that provided for under (e); in return for the teaching service rendered each teaching fellow to receive from the high school in question a stipend of say one hundred dollars (five months at twenty dollars per month); during this period of supervised teaching, each fellow to carry on such study and make such reports as may be demanded by the university.

(d) Each teaching fellow to spend one semester in such actual teaching service, at the end of which he or she shall return to the university for one semester of graduate study in fulfillment of the requirements for the advanced course for the training of teachers; at the conclusion of such advanced study, and upon evidence of the successful accomplishment of the work in the cooperative high school, there would be awarded a First Grade Secondary School certificate, a certificate to be created by legal sanction, for the best prepared and the most efficient only of the secondary school teachers in the state.

(e) For the proper oversight of the scheme of teaching fellows a special university office (supervisor of teaching fellows) to be created for the proper visitation and supervision of the work of the teachers while in service in the cooperative high schools.

I am firmly convinced that only through some such plan as this will the university be enabled to afford that quality and amount of training needed on the part of efficient secondary school teachers.

The application of the fellowship idea with its honorarium principle to preparation for teaching seems to be fully justified, in view of present and future needs. It will neither cheapen nor enervate such preparation, but on the contrary will stimulate and encourage a far more thorough preparation and will result in a far more rigid selection of the best teachers than is possible under the present regime of indefinite professional preparation and inadequate compensation. The teaching fellow, at the conclusion of the period of fellowship, will be qualified, and I doubt not, sought after, for the most desirable, the most permanent, and the best compensated positions.

INCREASE OF EXPENDITURES.

The plans for the university secondary school and for the system of teaching fellowships call for a considerable expenditure. The state, I believe, will be more than willing to provide the necessary funds did the university make known its great need for the development of the work of the training of teachers. The proposition would find abundant support in the legislature, and would be encouraged and helped by the efforts of men and women throughout the state who are anxious that the university should enter upon a more positive and progressive policy in the solution of this great educational problem of the secondary school system of the state.

Financial provision should also be made for the following items which I merely enumerate. Their general importance is well recognized and they have already been discussed in an informal way:

Educational Museum.—Each department offering special work for the training of teachers, as well as the department of education, stands in need of complete collections of text books, apparatus illustrative of technique and conditions of instruction, charts and all such material as would find a place in a pedagogical museum. At the present time the small collection of secondary school text books, made largely by donations from publishing houses, is wholly inadequate and wholly incomplete to meet the requirements that have arisen through the development of the departmental teachers' courses. Not only should this text book library be brought to the state of greater usefulness, but proper accommodations should be provided so as to insure its protection and to permit its convenient utilization by students. To this end it must be given suitable space and some clerical oversight must be employed.

A very conservative estimate would indicate that two thousand dollars should be made available immediately for the purpose of the educational museum.

Cooperation with Madison High School.—If the plan of cooperation with the Madison high school continues in operation, efforts should be made to add to the number of the class of special teachers, now represented by Mr. Bassett. Thus far, from lack of funds, we have been unable to make use of the opportunities that have come through the changes in the high school corps of teachers. Under the terms of the agreement with the board of education, five of these special teachers may be appointed. Provision should be made so that the necessary funds would be available, whenever the opportunity arises, for securing the appointment of more of the special teachers. The experience of the past year with the English instruction in the high school, and the departmental teachers' course in English under Mr. Bassett, tends to confirm me in my conviction that a departmental teachers' course is most productive of good to the preparing teacher, when under at least the partial direction of a master secondary school teacher of the subject.

Departmental Teachers' Courses in Science.—The demand for competent teachers of science by the high schools of the state is becoming continually more than the university is able to meet. The supply of science teachers can be largely increased, I think, by carefully directing the attention of students preparing to teach to the opportunities. There is need, however, of extending the special professional instruction for teachers of science within the university. This need is especially great in physics, probably the most important of the sciences taught in the accredited and free high schools of the state. As already indicated, arrangements have been made for departmental teachers' courses in the sciences for the coming year, 1908–9.

The University Summer Session.—With the institution of the advanced course for the training of teachers under conditions which will cause this course to be accomplished by students largely during the summer session, has developed the need of devoting considerable attention to the character of the courses offered so as to enable students to fulfill the spirit of the requirements of the advanced course, viz., that the work taken should be professional in nature, especially adapted to those who stand in need of more thorough and more advanced preparation to teach. In this connection the conduct of model classes becomes of great significance. It is to be hoped that the necessary financial provision will be made for the organization and support of some such classes during the summer session of 1909.

THE UNIVERSITY AND THE RURAL SCHOOL SITUATION.

By the terms of the so-called Nelson amendment to the Federal appropriation act for the benefit of the agricultural college of March 4, 1907, a portion of the increased appropriation may be used for providing courses for the special preparation of teachers of agricultural and mechanic arts. In cooperation with the college of agriculture and the college of engineering, the course for the training of teachers should be extended or modified, so as to afford adequate opportunities for the training of special teachers of agriculture and manual training. The rapid development in recent years of elementary training schools for rural teachers has created a demand for such special teachers which the university should endeavor to meet. The chair of agricultural education made possible by the Nelson amendment will render possible the establishment of a closer and more helpful relationship with the rural school interests of the state. The opportunity is one that justifies immediate action.

CONCLUSION.

Several other important problems in the matter of the training of teachers are pressing for consideration. The working relation of the teachers of the high schools to the inspection and accrediting of those schools, the whole matter of the institution of an equitable and satisfactory plan for the certification of high school teachers, and the adjustment of the work of the course for the training of teachers to the work of the state normal schools, are the foremost of these problems. The coming year should enable us to do much for their solution.

Respectfully submitted,

EDWARD C. ELLIOTT,

Chairman, Committee on the Training of Teachers.

August 18, 1908.

REPORT OF THE DIRECTOR OF THE SCHOOL OF MUSIC

DEAN E. A. BIRGE,

College of Letters and Science.

DEAR SIR:—I desire to hand you herewith a brief report of the school of music, covering the period beginning with my assumption of the duties of director of the school, and of professor of music a year ago last September.

During the college year 1907–8 there were 353 students enrolled in the school of music, as follows: graduate students, 11; collegiate, 139; academic, 203. The total enrollment for the year 1906–7 was 320.

The staff of instruction for last year consisted of seventeen teachers, divided into departments as follows: theory, 3; piano, 6; voice, 3; violin, 1; organ, 1; public school music, 2; mandolin, etc., 2; harp, 1.

The enrollment on October 20 of the present year was 12 more than at the same date last year, but registration in the school of music is so variable that no definite deductions may be safely made from the above fact. There is a noticeable increase, however, in the number of students regularly matriculated in the college of letters and science, who are pursuing the study of music, either applied (instrumental or vocal) or theoretical, in the various elective courses. These elective courses are open to students, freshmen excepted, in any department of the university who show sufficient musical ability to pursue them with profit, and nearly all of them allow the same credit toward baccalaureate degrees as similar courses in other departments of the university. These credit-bearing courses include the subjects of harmony, counterpoint and fugue, musical composition, history of music, public school music, advanced study in orchestral music, musical appreciation, masterpieces of music and choral practice (in rehearsal with the Choral union). In addition credit may be obtained by students of junior and senior college grade for advanced piano playing, singing, organ and violin, but not to exceed in amount a total of ten semester hours.

In this connection it might be stated that the credit-bearing courses in music total 38 semester hours, and that of this amount a college student who desires to specialize in music, may elect, during his sophomore, junior and senior years, courses which would total 20 hours counting toward the 120 hours required for graduation. Very few, however, actually elect more than 10 or 12 hours during their college course, while the majority who elect music confine their elections to two or three courses, such as harmony, history of music, or musical appreciation.

Three new courses are offered for the first time this year, viz.: course 13, musical appreciation; course 14, masterpieces of music; and course 15, choral practice. All of these courses have for their object the increasing of facilities for students to acquire an intelligent appreciation of music as an indispensable element of culture. The first two courses present, through lectures and copious musical illustrations, a study of the elements of intelligent enjoyment of music, from the standpoint of the listener rather than the performer. They are intended to reach the general student body and no technical knowledge of music is required for entrance to them. The class room work is supplemented by monthly recitals before the class, illustrating more in detail the various national and individual characteristics, styles of writing, characteristics of different centuries and periods, etc.

With the same general object in view, but with more special reference to students of the school of music, there was instituted last year a series of six artists' recitals, which students of this department were required to attend, for which an incidental fee of fifty cents a semester was charged. This series was successful, and a similar series on somewhat broader lines is being given during the present year.

The development of the school of music is greatly retarded by the lack of adequate quarters for teaching studios, practice rooms for students, and especially by the conspicuous lack of a suitable concert hall and pipe organ. Assembly hall is too small for large concerts, especially those in which a chorus takes part, and the university gymnasium is ill-suited both for musical purposes and for comfort of audiences.

Respectfully submitted,

R. G. COLE,

October 26, 1908. ***Director.***

REPORT OF THE DEAN OF THE COLLEGE OF MEDICINE

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I submit my report as dean of the college of medicine.

ORGANIZATION.

In the biennial report for 1904–6, the dean of the college of letters and science discussed at some length the courses preparatory to medicine, which had been given in that college for over a quarter of a century with marked success. Much of the work which now constitutes an important part of the medical curriculum was given in a thorough way in the pre-medical courses at Wisconsin before it was well given in the medical schools. Dean Birge pointed out the value of adding such departments to the university as would materially strengthen the work in the medical sciences, and at the same time the need of incorporation of a college of medicine in order that our students might get time credit, as well as subject credit, in the medical schools to which they go for the clinical part of the course.

In the biennial report of the president for 1904–6, considerable attention was given to the broader aspects of the establishment of a college of medicine at the university, and to the need for the establishment of such a college, not only for the sake of educating those preparing to practice medicine and hygiene, but also in order that proper support be given research and investigation into the cause and prevention of disease in man and animals.

The legislature in the spring of 1907 passed a bill establishing a college of medicine at Wisconsin. In October, 1907, the regents formally authorized the organization of this college. In departments already established in the college of letters and science, work was being given fully equivalent to that of the first year, and to a considerable part of that of the second year, of the medical course in the better medical schools. This work in the basal sciences of the medical curriculum was closely correlated with fundamental pre-medical scientific work in physics, chemistry and biology. In order to preserve this correlation, the college of medicine was established so as to "comprise those scientific departments of the university which offer special courses to pre-medical or medical students."

The departments included in the college of medicine were as follows: chemistry, physics, botany, zoology, anatomy, physiology, bacteriology and hygiene. All of these departments were, at the time of the organization of the college of medicine, component parts of the college of letters and science. Those departments, such as anatomy and physiology, in which the teaching is mainly devoted to medical students, as well as the other less technical departments, have been, for the present, kept for certain administrative purposes in the college of letters and science. During the past year, two new departments have been established, the department of pathology, and the department of pharmacology and toxicology. In the psychological division of the department of philosophy, a special course has been arranged for medical students. Although the courses offered in the new departments are such as would, as a rule, appeal merely to students of medicine or of hygiene, the scientific attitude taken by those in charge of these departments makes them properly belong in the college of letters and science, as well as in the college of medicine. While it may ultimately prove best for administrative purposes to separate from the college of letters and science those departments most directly devoted to medicine and hygiene, such as the departments of anatomy, physiology, medical bacteriology and hygiene, pathology, pharmacology and toxicology, the present arrangement has proved convenient, and in fact the only method which is practical unless special appropriation be made for medicine and hygiene.

The faculty of the college of medicine was defined as consisting of "those members of the instructional force who supervise or conduct special courses for pre-medical or medical students." Dr. C. R. Bardeen, professor of anatomy, was appointed dean. The faculty elected Professor C. E. Allen secretary and authorized the appointment of an executive committee which should have general supervision of instruction in the medical courses. Professors Joseph Erlanger, R. A. Harper, Louis Kahlenberg, W. S. Miller and M. P. Ravenel were appointed to serve with the dean upon this committee.

For 1907–8 there was offered the work of the first year and a part of that of the second year of the medical curriculum, substantially as given in the better medical schools of the country. The value placed on the instruction at Wisconsin was at once shown by the offer on the part of the best class of medical schools to admit our students to advanced standing, and grant them full credit, without special examination, for work done here. In some instances this credit without examination had not previously been granted students who had studied in fully organized medical schools of the better class.

The addition of departments of pathology and of pharmacology and toxicology makes it possible to offer for the year 1908–9 the full first two years of the four-year medical curriculum. Owing to lack of clinical facilities, it is not possible at present to organize the last two years of the medical course. It would undoubtedly be to the advantage of the state to have departments of clinical medicine in the college of medicine. Wisconsin cannot well avoid this most important branch of education indefinitely. For the present, however, it seems best to get the first two years of the medical curriculum thoroughly established and to develop hygiene and preventive medicine. By the time this work is thoroughly organized and efficiently supported, means for the establishment of clinical departments fully worthy of the university may appear. Wisconsin certainly should not attempt to give instruction in the clinical branches of medicine until it is certain that the best instruction of this kind can be offered. The college of medicine should not attempt to spread into a new field at the expense of the proper development of the work it has already undertaken.

RECOGNITION.

Although the college of medicine has been established but a year, and the second year of the course has just been organized, the new college has been given a hearty recognition. Mention has already been made of the credit accorded Wisconsin students by other medical colleges. State boards of medical examiners have given us recognition. Wisconsin has been elected a member of the Association of American Medical Colleges and is represented on the committee of five on medical teaching in that association. The university is likewise represented on the committee on preliminary medical education of the American Medical association, and was also represented at an informal conference of university medical schools which met to consider the standardization of teaching in medical colleges of the highest grade. The chairman of the special committee of the American Medical association appointed to consider the reorganization and standardization of anatomical teaching in American medical schools is a member of the Wisconsin faculty. A member of the Wisconsin faculty is on the committee of the American Medical association appointed to consider the revision of medical ethics. Wisconsin men have taken a prominent part in the International Conference on Tuberculosis, now being held at Washington. The faculties of few colleges of medicine are better represented in the Society of Experimental Biology and Medicine, in which membership is a recognition of scientific activity. In short, it may fairly be said that Wisconsin is already called upon to take a leading part in the advance of medical education and medical science in this country.

DEGREES.

When medical schools were first established in America, two kinds of degrees were granted, that of bachelor of medicine and that of doctor of medicine. Later the granting of the former degree was discontinued, so that today it is universally the practice to grant merely one degree, that of doctor of medicine, and to grant this degree only to such students as have passed at least the last one of the four years of the medical curriculum in the college granting the degree. In England, at Oxford and Cambridge, the custom has long prevailed of granting a medical degree to students who take the clinical part of the medical course elsewhere, but return for graduation. Such a degree would not be recognized in this country by the state boards of medical examiners. It therefore does not seem practical at present for Wisconsin to grant the degree of doctor of medicine to students who take the first two years of the medical course here and then go elsewhere to complete their medical studies.

In some English universities the degree of bachelor of hygiene is granted. With the further development of work along the lines of preventive medicine and hygiene, it may prove worth while to establish a course in the college of medicine leading to the degree of bachelor of hygiene. Under conditions at present existing, it has seemed best, however, not to attempt the granting of any degrees in the college of medicine. The university faculty recommended, and the board of regents in October, 1907, adopted the following regulations:

"The faculty of the college of medicine shall at present recommend no candidates for degrees, but shall recommend certificates for students who successfully complete one or two years of work in the college of medicine.

"Students who take part of their work toward the degree of bachelor of science or of bachelor of arts in the college of medicine, shall be subject to the rules and regulations of the college of letters and science, as well as those of the college of medicine. They shall be recommended as candidates for these degrees by the faculty of the college of letters and science. Graduate students in the college of medicine, taking work toward the degree of master of arts or of science, or toward the degree of doctor of philosophy, are subject to the rules and regulations of the graduate school."

The faculty of the college of letters and science adopted the following regulations:

"1. Candidates for the degree of bachelor of arts may be registered for but one year in the college of medicine.

"2. Candidates for the degree of bachelor of science (medical science course) may be registered two years in the college of medicine. The language requirements are those required for admission to the college of medicine. Students may elect up to eighteen unit-hours per semester and may confine this work to the science and language groups of studies."

ADMISSION REQUIREMENTS.

The faculty of the college of medicine adopted as requirements for matriculation at least two years of college work, which should include courses in physics, chemistry, biology, and language. In nearly all the better American medical colleges, at least one year of college work devoted to physics, chemistry, biology and language will be required for matriculation by the fall of 1910. In most colleges of the higher type at least two years of college work are now required for matriculation, and several require three years or a full college course. To those acquainted with the training offered in most high schools in this country, it is obvious that thorough courses in physics, chemistry, biology and a modern language cannot be simultaneously successfully pursued by the average freshman in a single year, and that at least two years of college work should be devoted to these subjects. For this reason, at least two years of college work were adopted as a condition for matriculation in the college of medicine here. Two years of college work, preceding a four-year medical course, makes the combined pre-medical and medical work six years. This seems the most that can fairly be demanded by a state university, in which opportunity for study should be offered to the greatest possible number consistent with maintaining high standards of efficiency. The longer a course is made, the fewer will be those who can afford it. On the other hand, if the course of study is so contracted that it does not give a thoroughly efficient training, it cannot accomplish all it should. It is to be hoped that many of our students will take three or four years of work in the college of letters and science before matriculating in the college of medicine. For students who can see their way clear to do this it is obviously advantageous.

NUMBER OF STUDENTS.

Merely the first year of the medical course was open for registration during the year 1907–8. In all, 26 students registered, 23 men and 3 women. Eight were graduates of colleges of arts and science, seven were seniors in the college of letters and science, and eleven were juniors in that college. There are indications that the number of students in each class will, within a few years, considerably exceed the number in the first class. In planning facilities for the college of medicine, I believe that immediate provision should be made for at least fifty students in each class.

DEPARTMENTS.

The departments which form constituent parts of the college of medicine likewise are in the college of letters and science. The intimate relations between the two colleges make it somewhat difficult to determine just what to include in making a report on the college of medicine. I shall here summarize the work of the past year in the departments of anatomy, physiology and physiological chemistry, and of bacteriology and hygiene in so far as the work in these departments relates primarily to medicine and hygiene, and shall point out the immediate needs of each of these departments. I shall then sketch briefly the organization and purposes of the new departments of pathology, and of pharmacology and toxicology, the establishment of which was authorized by the board of regents at the time of the organization of the college of medicine. Reference will also be made to the new course in psychology.

Anatomy.—The organization of the college of medicine has made necessary the establishment of a new course in topographical anatomy in this department, and has caused an increase in the number of students in all courses. Dr. B. M. Allen has been promoted from an instructorship to an assistant professorship. It has not as yet been necessary to enlarge the staff, but with further increase in the number of students, it will be necessary to add one or more instructors. There is urgent need of greater laboratory space, especially for histology, neurology, and embryology. This can doubtless be provided when the departments of botany and zoology are moved to the new biological building. Scientific investigation in the department has been largely devoted to factors concerned in reproduction, and in embryonic development. Professor Miller is continuing his valuable studies on the structure of the lung.

Physiology.—In the reports of the president of the university and of the dean of the college of letters and science for 1904–6, mention was made of the establishment of a department of physiology and physiological chemistry, and of the appointment of Dr. Joseph Erlanger as professor of physiology, and of Dr. Harold C. Bradley as professor of physiological chemistry. Temporary quarters for these departments have been established in the chemical engineering building, and equipped for teaching and investigating all branches of animal physiology and physiological chemistry. In addition to courses designed primarily for students of medicine and advanced students of physiology, the department of physiology in conjunction with that of anatomy during the past two years has offered an elementary course in physiology. During the year 1908–9, this course will be given entirely in the department of physiology. Dr. W. J. Meek, a newly appointed instructor, will have immediate charge. A course in elementary physiology ought to be of interest not only to prospective teachers of physiology in the elementary schools, but also to a considerable number of students who would take it for its cultural value. To make the course thoroughly effective, laboratory work should be offered in conjunction with lectures, demonstrations, and quizzes. Unfortunately, the limited space now occupied by the department makes this impossible. In fact, the department of physiology is already hampered by lack of space, not only in the development of new courses of a popular character, but also in giving instruction to medical students and in advanced work and research. It is essential for the proper development of the department that as soon as possible permanent quarters of an adequate character be provided for it. This seems possible in the new biology building for which plans are being made. With further increase in the number of students, one or more additional instructors will have to be added to the staff. In scientific production the laboratory has been active in spite of cramped quarters. In physiology attention has been directed mainly to the mechanism of the heart beat, a subject to which Professor Erlanger has already made numerous valuable contributions. In physiological chemistry, under the direction of Professor Bradley, investigations have been made into the metallic content of the tissues.

Bacteriology and Hygiene. — Although primarily developed chiefly in its relations to medicine and hygiene, the science of bacteriology has since become of fundamental importance in other lines, especially in agriculture. In the department of bacteriology and hygiene there is offered an elementary course which prepares for higher studies in various directions, but mainly along the lines of medicine, hygiene and agriculture. Scientifically, the department has hitherto been especially productive in the latter direction. The appointment of Professor M. P. Ravenel, in 1907, as professor of bacteriology will doubtless add much to the scientific activity along medical and hygienic lines. During the past year Professor Ravenel has taken an active part in the crusade against tuberculosis, already begun by Professor Frost and Professor Russell. This crusade has begun to be effective, and it appears that the state of Wisconsin is to be among the leaders in this, as in so many other lines of advance. No better example of the value of the cooperation between preventive medicine as regards animals and that as regards man is offered than by the crusade against tuberculosis. Tuberculosis in domestic animals and in man must be fought simultaneously, if it is to be eradicated.

The transfer of the department of domestic science from the college of letters and science to the college of agriculture, has made it possible to utilize for bacteriology and hygiene the space hitherto occupied by that department in south hall. The laboratory for general bacteriology has accordingly been transferred from the fourth to the third floor of south hall. The fourth floor will now be used for advanced bacteriology and pathology. The state hygienic laboratory will be brought back to south hall from agricultural hall, where it has been situated for a few years. The department of bacteriology and hygiene, the department of pathology, and the state hygienic laboratory will thus be brought into advantageous relations to one another. While the laboratories are far from adequate for the proper development of the important work entrusted to them, they will offer moderately good facilities for a few years.

Pathology.—Dr. Charles Henry Bunting, a graduate of Wisconsin and of the Johns Hopkins University, who for two years has held the chair of pathology and bacteriology at the University of Virginia, has been appointed professor of pathology. Dr. W. H. Brown, who has been instructor in pathology at Virginia, has been appointed instructor in the same department. As mentioned above, laboratories for this department are being fitted up on the fourth floor of south hall. Courses for students of medicine will begin after the Christmas recess and continue till the end of the college year. In connection with the department, a pathological museum has been started. For material for this museum we are indebted to numerous physicians resident in the state, and especially to Dr. A. J. Ochsner of the Augustana Hospital, Chicago. It is hoped, through the cordial relations established between Wisconsin physicians and the college of medicine, that much valuable material may be obtained for the museum, and that at the same time the material in the museum may prove of use to physicians engaged in study of special pathological conditions. In connection with the department there should be a division to which physicians might send pathological tissues for diagnosis, as they can now send bacteriological material to the state hygienic laboratory. In scientific research the resources of the laboratory will be directed toward a study of animal as well as human disease.

Pharmacology and Toxicology.—Dr. A. S. Loevenhart, who has been associate professor of pharmacology and toxicology at the Johns Hopkins University, has been appointed professor of pharmacology and toxicology. Dr. W. E. Grove, a graduate of Wisconsin and of the Johns Hopkins University, has been appointed instructor in the department. For the present, a small private laboratory and a small office have been provided for this department in the attic of the chemical engineering building. The already overcrowded lecture room and laboratories of the department of physiology are to be utilized for giving instruction to students of pharmacology and toxicology. Of all departments in the college of medicine, that of pharmacology and toxicology has the least adequate laboratory space. It is exceedingly desirable that as soon as possible better quarters be provided. In spite of the great part drugs have played in the history of human medicine, careful scientific study of their action is of comparatively recent date. Few colleges of medicine in this country have well organized departments of pharmacology in which scientific work is carried on. Professor Loevenhart's previous work shows that he is capable of conducting a laboratory of this character, and he should be provided with every facility for doing so.

Psychology for Medical Students.—Although a preliminary training in physics, chemistry and the biological sciences is now demanded in the better medical schools as a pre-requisite for clinical medicine, training in psychology is not generally made a pre-requisite for the study of mental diseases and of psychological treatment of disease. This we deem a serious defect in educational standards. To avoid this defect, a special course in psychology has been arranged for second year medical students by Professor Jastrow. This course will be required of all second year medical students who have not had a course in psychology before entering the college of medicine. Special attention will be paid to the experimental aspects of the subject. In the development of this course, some new apparatus will be required.

NEEDS OF THE COLLEGE.

In connection with each of the departments discussed in the preceding section, the more pressing needs have been pointed out. In these departments facilities are provided for giving the first two years of the medical curriculum, and for investigation in the basal medical sciences. They likewise provide opportunities for popular courses in physiology and hygiene. Through the state hygienic laboratory and through the extension division of the university the work in hygiene and the medical sciences at the university can be made of direct value throughout the state, especially along the lines of preventive medicine.

In the immediate development of the college of medicine we should look not toward the organization of new departments, but toward the strengthening of those already established. With an increase in the number of students it will be necessary to add a few instructors. It will also be necessary, doubtless, to make some promotions in the faculty. But it will not be necessary in the near future to add to the number of those having charge of departments in the college of medicine. There is, however, urgent need for more adequate quarters, for increased equipment, and for library facilities. The state hygienic laboratory needs far more ample financial support than it has received. Further provision should be made for the promotion of medicine and hygiene through the extension division. These needs may be briefly outlined as follows:

Building for Medicine and Hygiene.—The laboratories for the medical sciences are now scattered about the campus in temporary quarters fitted up in the attics of buildings originally designed for other purposes. The department of anatomy is situated chiefly in part of the old attic of science hall. The department of physiology occupies a part of the attic and a part of the second floor of the chemical engineering building. The department of pharmacology and toxicology has two small rooms in the attic of the chemical engineering building. The departments of pathology and bacteriology and the state hygienic laboratory occupy the two top floors of south hall, originally designed as a dormitory and far from ideal for laboratories. The work of these various departments could be more economically and effectively performed in laboratories especially designed for the purposes to which they are put, and conveniently located with respect to one another. The work of the different departments is so closely inter-related that each would benefit greatly from close association with the others. The complete biological building at present contemplated would offer ample space for the departments of the medical sciences as well as for the departments of zoology and botany. The portion of the building, the construction of which is planned in the near future, will provide little more space than that desired by the departments of zoology and botany. It will take some crowding to make room in addition for the departments of physiology and pharmacology, and it is out of the question to attempt to make room for the other medical sciences. It is highly desirable that provision be made as soon as possible for a wing of the new biological building in which quarters can be given to anatomy, pathology, bacteriology, and hygiene, and the state hygienic laboratory, as well as more space to physiology. After the departments of botany and zoology are transferred from science hall to the new biological building, fairly adequate quarters can probably be provided in science hall for anatomy, but it will be advantageous for this department to be brought into close relations with botany and zoology on the one hand and with the various medical sciences on the other, as soon as sufficient space in the biological building can be provided. For pathology, bacteriology, and hygiene, and the state hygienic laboratory, south hall can never provide really adequate quarters. The neighboring state universities have provided splendid buildings for the medical sciences. Wisconsin cannot afford to delay following the example thus set.

Equipment.—The departments of bacteriology, anatomy and physiology are fairly well equipped as compared with similar departments in other institutions. The increase in the number of students consequent upon the organization of the college of medicine will, however, necessitate considerable new apparatus. In various directions the equipment could, with great advantage, be made more complete. For the department of physiology, for instance, a shop for the repair of instruments should be provided. The department of pathology will require much more apparatus than it has at present. The department of pharmacology and toxicology is depending this year mainly upon the department of physiology for apparatus. It will have to have good equipment of its own as soon as suitable quarters can be provided for it.

Library.—For the departments of bacteriology and hygiene, anatomy and physiology, a fair beginning has been made in the acquisition of technical books and journals. For the new departments of pathology and of pharmacology and toxicology, with a few trifling exceptions, merely those books are as yet available which have been acquired for the work of other departments. The library is lacking in medical journals of a general scientific character of interest to all the departments mentioned. There is no more urgent need for the college of medicine than a liberal special appropriation for books.

State Hygienic Laboratory.—This laboratory formerly received a small direct appropriation from the state. In 1906 this appropriation was discontinued and the care of the laboratory was entrusted to the university. Provision is made for it in the budget of the college of letters and science. This provision is entirely inadequate for the work which the laboratory should perform, and is very small in comparison with what similar laboratories receive elsewhere. In Minnesota nearly ten times as much is appropriated for the state hygienic laboratory as in Wisconsin. The equipment of the laboratory is very meager and should be greatly strengthened. With the present equipment much valuable work is being done in the diagnosis of diphtheria, tuberculosis, and rabies, in testing of water supplies, etc. The addition last year of a sanitary chemist, Mr. J. T. B. Bowles, to the staff of the hygienic laboratory, was an important step in advance, but a larger staff of assistants should be provided so that diagnoses of material sent in could be more promptly made. The state hygienic laboratory is of assistance not only to the state board of health, but also to various local boards of health, to municipalities desiring to improve their hygienic conditions, and to the medical profession. Funds should be provided for state surveys of hygienic conditions such as that of the water supply of the state. In studies of this kind the state and the national governments can frequently combine forces. Thus in Minnesota a survey of the water supply of the state was made conjointly by the United States government and by the state hygienic laboratory. The departments of bacteriology and pathology in the university will benefit greatly from affiliation with the state hygienic laboratory, and in turn will add much to the effectiveness of that laboratory. Relations of this kind are essential if the state hygienic laboratory is to take up the preparation of or the testing of serums. No more brilliant contributions have been made to medical science than the discovery of specific serums for the cure of some of the contagious diseases, especially diphtheria and lockjaw. The state board of health is authorized by state law to furnish anti-toxin serum to the indigent of the state. It is highly essential that these serums should be thoroughly reliable. This is not always the case with commercial serums. In the last biennial report it was pointed out that in some states, as for instance Massachusetts and New York, the serum for state use is manufactured under the direction of the state hygienic laboratory. In Germany all anti-toxins and serums are examined and stamped by the government laboratory. The state hygienic laboratory should at least be enabled to test and certify to the purity of the serums distributed by the state. Development of comparative pathology will make this possible, if sufficient funds be provided. Vaccines and other complex biological substances could be tested in the same way. Indeed, it seems highly probable that with the development of biological chemistry, many more complex substances of the greatest value to medicine and hygiene will be discovered, and that with the development of highly complex remedies, state laboratories in which they can be carefully tested and their value certified, will become more and more important. While comparatively harmless if pure, diphtheria anti-toxins may be frightfully poisonous if slightly contaminated. This is likely to be true of all the more complex biological remedies. The departments of pharmacy and of pharmacology and toxicology will prove of the greatest value in developing the work of the state hygienic laboratory in this direction.

Extension Division.—In conjunction with the extension division of the university, the college of medicine should be able to do much to encourage throughout the state an understanding of the value of preventing disease and of the ways and means of doing this. An example of work along these lines is furnished by the tuberculosis exhibit of the university, which was displayed in several parts of the state during the past year and in connection with which explanatory lectures were given by members of the bacteriological department. A much more extensive exhibit has been prepared for the International Congress on Tuberculosis at Washington and will be ready for use in the state on its return. Exhibits illustrating the causes and the effects of other preventable diseases might well be similarly arranged and exhibited. It is probable that nothing else would prove as effective in arousing public interest in preventive medicine. Correspondence courses would enable those interested to get a deeper understanding of the subject. In addition to this extension work of a more popular character, much good might be accomplished by technical pathological and other exhibits which could be sent out from the laboratories of the state university to meetings of county and district medical societies, and there utilized for illustrating various pathological conditions and the means of alleviating them. Advances in the medical sciences could thus be brought directly to medical practitioners and health officers throughout the state. This extension work would be much facilitated by having in the faculty of the college of medicine, men, a part of whose duties would be to take charge of the exhibits and explain them. The extension work might well be supplemented by special short courses for physicians and health officers, in the university laboratories.

Special Appropriation.—In the last biennial report it was pointed out that the addition of the first two years of a course of medicine with provisions for a course in hygiene, and for work in experimental animal and plant pathology, should involve a legislative appropriation, supplemental to that provided for the work hitherto undertaken by the university. In authorizing the establishment of a college of medicine, the legislature made no special appropriation for the new departments necessary for the first two years of the medical curriculum, nor for the contemplated extension of hygiene and preventive medicine. It was therefore necessary to exercise the utmost economy in the organization of the college of medicine and to give up for the present the contemplated expansion of the state hygienic laboratory. Extension work in hygiene has been provided on a moderate scale. I believe it of great importance that special appropriations be made for the college of medicine and for the state hygienic laboratory, so that the work planned can be carried out without restricting the development of other lines of activity in the university for which the two-sevenths mill tax was primarily provided. The need of a special appropriation of this kind becomes the more apparent when one takes into consideration the fact that the development of the college of medicine carries with it the development of pre-medical courses, and an increase in the number of students in departments of the college of letters and science not specifically described above, such as those of chemistry, physics, biology and the modern languages.

Respectfully submitted,

C. R. BARDEEN,
Dean.

September 30, 1908.

REPORT OF THE DEAN OF THE COLLEGE OF AGRICULTURE

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—Herewith I submit a report on the condition of the college of agriculture for the biennial period closing June 30, 1908. For the first fiscal year of this period, the direction of this college was under Professor W. A. Henry.

The following synopsis indicates the scope of this report:

I. Changes in faculty.
II. Improvements and resources.
III. Work of the college proper.
IV. Research work of experiment station.
V. Extension service.
VI. Needs of the college.

I. CHANGES IN FACULTY.

The staff of the agricultural college has been somewhat enlarged during the present biennial period, as is shown in the following table, in which is given the number of members of staff engaged in full time work (excluding winter term work):

	Professors.	Associate and assistant professors.	Instructors.	Assistants.	Total.
June 30, 1906	9	4	11	5	29
June 30, 1908	11	8	7	9	35

Resignations.—On account of ill health, Professor Henry, who for twenty-seven years has labored for the up-building of Wisconsin agriculture, resigned his position as dean of this college and director of the experiment station, and was made, by action of the regents in June, 1907, emeritus professor in agriculture.

Dr. A. F. McLeod, instructor in the department of soils, resigned to accept a position in the University of Chicago.

Mr. George A. Olson of the agricultural chemistry department, severed his connection with the station at the close of this academic year.

Mr. C. S. Knight, assistant in feed and fertilizer inspection, resigned to accept a position in the Kansas Agricultural College.

Appointments and Promotions.—Prof. E. B. Hart, who held the position of chemist in the New York State (Geneva) experiment station, was appointed professor of agricutural chemistry in July, 1906.

Dr. H. L. Russell, formerly head of the department of bacteriology, was made dean of the college and director of the experiment station, July 1, 1907.

Dr. Mazÿck P. Ravenel, assistant medical director and bacteriologist of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis, was appointed head of the department of bacteriology in July, 1907, in place of H. L. Russell.

Dr. J. L. Sammis, of the United States Department of Agriculture, who has been previously engaged in cooperative cheese work at this station, was appointed assistant professor of dairying, July 1, 1907.

Prof. R. A. Moore was promoted from assistant professor to professor of agronomy in July, 1907.

Prof. G. C. Humphrey was promoted from assistant professor to professor of animal husbandry, July, 1906.

Prof. D. H. Otis, was promoted from position of assistant professor to that of associate professor of animal nutrition in July, 1907.

Mr. C. A. Ocock, instructor in agricultural engineering, was promoted to the position of assistant professor.

Prof. F. W. Woll, associate professor, was made professor of agricultural chemistry in July, 1906.

Mr. J. G. Moore was promoted from instructor to assistant professor of horticulture, April, 1907.

Mr. C. W. Stoddart was promoted from instructor to assistant professor of soils, July, 1906.

Mr. E. J. Delwiche was appointed, July, 1906, superintendent of the northern sub-stations, located in the Lake Superior region.

Mr. Roy T. Harris was appointed assistant in dairy tests, July, 1907.

Mr. Geo. Hine was appointed assistant in fertilizer and feeding stuffs inspection, January 1, 1908.

Mr. Conrad Hoffmann was appointed assistant in agricultural bacteriology, July, 1906; promoted to instructor, July, 1907.

Miss Louise Jahns was appointed assistant in soils, October, 1907.

Mr. E. R. Jones was promoted from assistant to instructor in soils and drainage, July, 1906.

Dr. E. V. McCollum was appointed instructor in agricultural chemistry, July, 1907.

Mr. Mathias Michels, in March, 1907, was appointed instructor in dairying; placed in charge of cheese and butter scoring exhibitions.

Mr. J. G. Milward, in July, 1906, was appointed assistant in horticulture; made instructor in July, 1907, and placed in charge of demonstration work on potatoes.

Mr. A. J. Rogers was appointed assistant in horticulture, April, 1907.

Mr. W. E. Tottingham was appointed instructor in agricultural chemistry, July, 1906.

II. PERMANENT IMPROVEMENTS AND ADDITIONS TO RESOURCES.

EQUIPMENT.

Lands.—In compliance with the policy of the university to secure unoccupied lands immediately adjacent to the present university campus to an extent which will permit of necessary future growth, there was purchased in 1906 for the use of the college of agriculture, two tracts of two and a half acres each, known as the Corry and King tracts lying immediately adjacent to the present university farm.

Opportunity presented itself last year to secure a favorable option on a seventy-acre tract, lying immediately adjacent to the Hill farm. This tract, known as the Koch tract, was leased for five years with the privilege of buying at a fixed price within this time. The use of these lands will give opportunity for much needed expansion of the herds and flocks of the animal husbandry department, and for the production of pure-bred grains for dissemination throughout the state.

Buildings.—The two new buildings for the departments of agronomy and agricultural engineering, the erection of which was authorized in the previous biennium, were completed and occupied in 1907. They are located immediately in front of the central agricultural building, and are the first buildings to front the projected plaza which is to connect the agricultural grounds with University avenue. Both of these buildings are of fireproof construction, being built of re-inforced concrete and brick, with tile roofs. The engineering building cost approximately $43,000, and with present equipment, nearly $50,000. The agronomy building cost $36,000. The equipment of these buildings has not been entirely completed.

The soils greenhouses were practically rebuilt last fall, and advantage was taken of this necessary improvement to re-construct the roof along more practical lines than the original plans.

A new stave silo was also constructed at the dairy barn, to be used in making silage for summer use. This season has given us a splendid opportunity to test the value of this method of feeding dairy animals. The milk flow of the university herd never has been maintained so high as during the drought of this summer.

The new animal husbandry pavilion, the erection of which was authorized by the regents in the spring of 1908, is now rapidly being built. This amphitheatre, having a seating capacity of 2,000, will give exceptionally good facilities for the handling of large gatherings. It is to be hoped that the structure will be enclosed and the arena made available for the farmers' course, to be held in February of the next year.

MAINTENANCE FUNDS.

Adams Fund.—The financial resources of the experiment station have been materially increased by Congress in giving ultimately to each state experiment station $15,000 per year, in addition to the Hatch fund. The amount received from this federal appropriation was $9,000 for 1906–7, and $11,000 for 1907–8. This money is "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States. It is for the more complete endowment and maintenance of the experiment stations, presupposing the provision of a working plant and administrative officers." This fund will doubtless do more toward elevating the scientific work of the federal experiment stations than any other factor.

Nelson Fund.—Further appropriations were made by Congress in the passage of the Nelson bill on March 4, 1907, appropriating to each agricultural college $5,000, and an annual increase of $5,000 until the total appropriation shall reach $25,000 annually. This fund is designed to supplement the Morrill Act of 1862, on which the land grant colleges were founded.

State Aid.—These funds are given by the federal government to aid and stimulate the development of agriculture, and the moral obligation, imposed upon each state receiving the same to supplement such funds so far as it is within its power, has been met by the state of Wisconsin in materially increasing the appropriations made to the work of the college of agriculture from the general treasury of the university. This college is receiving at the close of this biennium approximately $100,000 from the state for the distinctively agricultural work, the general university caring for the literary and natural science work which is mainly included in the first two years of the long course. While the larger part of this sum is spent in the teaching and research work of the college carried on at the university, a not inconsiderable portion is devoted to the demonstration extension work which is in progress throughout the various portions of the state.

The tax burden which this work imposes upon the resources of the state appears to be small in comparison with the advantages that flow from this work. A person paying taxes on an assessed valuation of $5,000 contributes about a quarter of a dollar annually to the support of this college.

University Creamery.—The operations of the university creamery have been unusually heavy this year, owing to the abundant milk flow, both last fall and this spring. The university paid the farmers of this section last year nearly $70,000 for milk, an increase of over 44 per cent over the previous year. Such a record cannot be maintained, as the pasture conditions were phenomenal for the past season. Our receipts will doubtless be diminished this coming year, not only by the shrinkage in milk, on account of drought, but by reason of the operation of the recent city milk ordinance which requires even our pasteurized milk and cream to come from tuberculin tested herds. Many of our creamery patrons are unwilling to have the test applied, and consequently their milk cannot be sold in the form of cream, which is, of course, the most profitable product in which to dispose of butter fat.

III. WORK OF THE AGRICULTURAL COLLEGE.

The work of the college proper is limited mainly to instruction here at the university. The growth of this work is reflected largely in the increase in students. During this biennium continued advance is to be observed in nearly all lines of work. The total registration for 1907–8 was 707, not including the 700 farmers who were in attendance upon the farmers' course during the winter; this is an increase of nearly 40 per cent in three years. Registration by courses was as follows for present and past bienniums:

SUMMARY OF STUDENTS.

	1904-5	1905-6	1906-7	1907-8
Graduates	7	7	8	14
Long course (four years)	80	136	142	146
Short course (2 winters, 14 weeks each)	304	322	327	390
Dairy course (summer and winter) 12 weeks	135	178	164	157
Totals	526	643	641	707

The facilities of the dairy school are always taxed to their utmost, and the efficiency of the work is impaired when more than 150 students are in attendance on the winter session. A considerable number of students avail themselves of the opportunity to get the maximum amount of practical work during the summer season.

The short course continues to grow apace, the increase in numbers last year over the preceding year being greater than that for the previous seven years.

Remodeling the Four-year Long Course.—The theory on which the long course in agriculture was founded, is that the basal university studies should be taken by the student preliminary to any of his special agricultural work. For this reason it was considered necessary for him to study physics, chemistry and biology before he began work in stock or corn judging. Experience with this type of course for six or eight years has demonstrated that such a curriculum is not wholly satisfactory.

The faculty of this college, after careful consideration, has remodeled the long course so as to introduce the distinctively practical work throughout all four years of the course. The requirements have been materially increased, 133 units of work and at least six months' practical farm experience being required for graduation. The number of units taken in the college of letters and science has been slightly reduced, but the new course still permits as much as 76 units of extra collegiate work.

Installation of a New Course.—A large percentage of students fail to complete their regular university course. Many are forced, for various reasons, to take special courses. To enable the farm boy who wants to get the most aid along the distinctively practical lines, while at the same time he is getting a good ground work in some fundamental science, like chemistry, the new two-year course is offered. This so-called "middle" course has the same entrance requirements as the long course, but the student is not required after entrance to take foreign language. This course is designed to give a much more thorough and comprehensive training than the short course, and yet requires but half of the time demanded for the long course.

From an administrative standpoint, this course can be conducted in a most economical manner, as the two and the four-year men take in the main the same lines of work. It is expected that it will more fully meet the desires of students, in that a defined curriculum is finished and recognition made of the same, which is not the case where the student takes special work and then drops out. Both the remodeled long course and the middle course go into effect this fall.

Improved Organization of Long Course Instruction.—In the early days of the agricultural college, the teaching work was subordinated to the experiment station. The work of the short course was compressed into three or four months, and the number of students in the long course was so small that the work was carried on in some departments individually, rather than in definitely organized class room form. With the rapid increase in students arose the necessity of more complete organization of the course work, not only for the general classes of the junior year, but of the advanced lines of work which should accompany the thesis work of the senior students. Considerable improvement in this direction has been accomplished within the last two or three years, but much more remains to be done, especially with the advanced courses, before the work is reduced to the best pedagogic form. The need of this exists not merely with reference to the lecture side of the subject, but the more practical laboratory, field, and factory operations should also be placed on a well defined basis.

Demand for Post-graduate Work.—The increased support afforded by Congress to the agricultural experiment stations in the Adams fund, and the interpretation of the department of agriculture that money received from this fund can only be used for pure research, has increased very materially the demand for more thoroughly trained men. Naturally the experiment stations are looking to the agricultural colleges to furnish these. The necessity for a more fundamental scientific training than is usually secured in a four year agricultural course is very evident, and there is a rapidly increasing demand on the part of students for special scientific facilities for such preparation. The agricultural colleges that are in close organic connection with the general scientific university work are in the best position to meet this demand. This university is among the few, in which, fortunately, such a close relation between pure and applied science exists, and a failure to develop these opportunities for the highest kind of scientific work will be to neglect one of the greatest advantages which we possess. Already a considerable number of graduates of our own and other institutions are taking further training, and I believe it is true that this college can do as much to advance agricultural science by developing the teaching facilities in this direction, as in any other line of activity which may be followed.

IV. RESEARCH WORK OF THE EXPERIMENT STATION.

It is exceedingly difficult to measure the net results of the experimental work of any institution and record how valuable and fruitful its energies have been. The teaching work expresses itself concretely, and may be compared in more or less mathematical terms in the number of students who are instructed. For some years the teaching demands of the college have been increasing so rapidly that the amount of time given to research has been materially reduced. For the best grade of research, uninterrupted time in periods of considerable length is necessary, and it has been increasingly difficult for members of the staff to secure this.

Notwithstanding these drawbacks, a considerable amount of important scientific work has been accomplished. Only a portion of this has been published within this biennium. During the last fiscal year, 15 bulletins, aggregating 669 pages, were published, in addition to the *Twenty-Third Annual Report* of 321 pages, making a total of 990 pages. This year the regular annual report of 437 pages, 11 regular and 2 special bulletins, aggregating 920 pages, have been printed in editions varying from 2,000 to 50,000 copies.

The federal department of agriculture exercises a much closer supervision over the nature of the scientific work carried on under the provisions of the Adams act than has been the case with the Hatch fund. Projects must be submitted in advance to the office of experiment stations and approved by them before being authorized. It is evident that too careful consideration cannot be given to the planning of the work beforehand, and the inauguration of this method of control will doubtless prove to be highly beneficial. During the last fiscal year this system of detailed projects has been extended to all of the research work of this station.

EXPERIMENT STATION RESULTS.

Space does not permit of the presentation of all phases of research work which have been under consideration during the past two years, but the most important contributions are briefly summarized, as follows:

A most important joint investigation between the animal husbandry and agricultural chemistry departments which has been in progress for the last two years is a series of physiological studies on nutrition.

1. So far, emphasis in scientific nutritional studies has been placed mainly on the rôle of organic substances in the animal

body—fats, proteins or carbohydrates. It is equally important that attention should be directed to the part played by other food constituents, more particularly the inorganic elements. In these studies phosphorus has been under consideration, and Professors Hart and McCollum, in cooperation with Professors Humphrey and Fuller, have made important discoveries. Pigs were fed on a depleted phosphorus ration alone, and also one supplemented with inorganic phosphates. Up to a certain point the phosphorus-low ration permitted apparently normal tissue development. In the course of some weeks, however, physiological disturbance became evident, and loss of weight and final collapse took place. Prior to this metabolic disturbance, the phosphorus content of tissues and body fluids remained parallel with that of control animals, in spite of the low phosphorus intake in the food. Such maintenance was traced to a withdrawal of the phosphates from the skeleton of the animal, as was indicated by the low ash content of the bones. Where physiological disturbance was observed, loss of appetite occurred, locomotion became impossible, and a gradually deepening stupor preceded the final collapse of the animal. Where the symptoms were not too pronounced, the animals recovered when supplied with feeds containing the organic phosphorus. Pigs fed from the first on depleted phosphorus rations supplemented with inorganic phosphates, such as ground phosphate rock (floats), made as vigorous growth as animals receiving organic phosphorus compounds.

While these experiments bring out certain facts of fundamental importance, they open up a promising field of investigation along practical, as well as scientific lines.

2. A cognate study has been made on the influence of certain bodies isolated from important dairy feeds. Feeders have long recognized the laxative effect which wheat bran exerts upon an animal. Bran is known to contain large quantities of phytin, an organic phosphorus compound, and metabolism experiments made on milch cows fed upon rations rich in bran, and therefore in phytin, and also where the phytin had been removed, demonstrated that the laxative effect of bran was attributable to the presence of this substance. So far, it has been impossible to dissect phytin and determine whether this pharmacological effect is due to the basic substances present or to the phosphorus compounds.

3. The chemist has materially advanced the science of feeding, by determining the relative proportion between the carbohydrates and protein. Practical experience has demonstrated that the most profitable ration should contain a certain ratio of these substances, but more emphasis has been laid upon the results of chemical analysis than on the possible physiological effect of the different constituents in feeding stuffs from different plant sources. Is the proteid or starch of one cereal grain identical in its physiological effect with that of other grains? For nearly two years, 16 young calves have been reared upon a balanced ration composed of nutrients from single, as well as mixed plant sources. By the usual methods of chemical analysis these rations are absolutely identical, and different lots of animals have been fed upon corn, wheat, and oats, respectively, and also a combination of all three nutrients. From an early stage marked physiological differences appeared. It is interesting to note that the "oat" group has consumed only 18 pounds of salt, whereas the "mixed grain" lot has eaten 277 pounds. The different groups have reached a stage of physiological maturity at widely differing times, the wheat-fed lot having the oestrum period greatly delayed. Practical dairy feeders regard the mixed lot as more normal than any of those receiving "single" rations.

It is planned to continue this experiment, placing all of the animals under the strain of reproduction, so that the effect of the treatment may be continued throughout a complete cycle.

4. Extensive trials with the mechanical cow milker have been completed and the large body of data accumulated gives a good foundation for conclusions of value.

Almost all of the animals took kindly to the machine, and after a few weeks' duration, were as cleanly milked by machine as by hand, although occasional individuals were more resistant. One operator can handle three machines with ease, and thus the drudgery of dairying seems likely to be overcome, and the dairy farmer rendered more independent as to the perplexing labor problem. The successful use of the machines requires a degree of care that is more than ordinary, and it is to be expected that dissatisfaction will not infrequently follow where careless handling obtains. No appreciable ill effect was noted on the animals, and with care the apparatus can be kept perfectly clean, so that a sanitary condition of the milk supply can be maintained equal to that of hand milking.

5. The improvement of our university herd continues. Seven cows qualified this last year for the advanced registry class. A Jersey animal, Double Time, recently made the record of the second best of this breed in America. In a seven-day test she produced 410.9 pounds of milk, containing 20.388 pounds of butter fat, lacking less than 2 ounces of equalling the best producer of her breed.

6. The Babcock fat test placed in the hands of the factory operator a simple, reliable, and inexpensive method of determining the amount of butter fat in milk. No similar method has previously been devised whereby the value of the casein, the leading nitrogenous constituent of milk and cheese, could be determined. Professor Hart has succeeded in devising a simple and accurate mechanical method for this purpose. Already a considerable number of factories are using the same, in conjunction with the Babcock test, as a basis for more accurate payment for milk. This discovery is not only of value to the factory operator, but places in the hands of breeders and dairymen an instrument which may result in the selection and development of high casein producing animals. Studies on our university herd show a variation of at least one per cent in casein content of Holsteins. The future breeding of these animals will now be watched to see if this function can be controlled.

7. The dairy department perfected last year a simple factory method for the determination of the amount of moisture in butter. This question has assumed special importance since the passage of the national food law, which considers butter adulterated, and therefore taxable, when it contains more than 16 per cent of water. This process enables the operator to determine accurately the water content of butter, thereby rendering his production more uniform under such control.

It is worth noting that of the six factory tests that are in general use in all dairy factory operations, five have been perfected by members of our staff, and three of the five tests are practically the only methods in use.

8. The cooperative work in cheese making with the United States department of agriculture, has been continued and extended during the past year. The experiments this year have been made with particular reference to the use of pasteurized milk, and while not completed, it appears that milk may be heated to 155°–160° F. in a continuous pasteurizer (stopping, in

large measure, bacterial development), and then brought to a standard degree of acidity by the use of commercial acid. The addition then of a properly selected starter supplies the necessary organisms and the further manufacturing operations can be successfully carried out in a uniform manner.

The pasteurized cheese so far made is uniformly clean in flavor, although the control cheese is often tainted. A slightly higher yield is obtained, due to the saving, in part, of some of the fat, and a somewhat higher moisture content of the curd. This process has not yet passed the experimental stage, but it is very suggestive as indicating the possibility of developing a uniform method of handling milks in cheese making.

9. Studies on origin of flavor in cheese have been continued by Professors Hastings and Hart. They have approached this subject from an entirely new point of view and are studying the influence which carbohydrates, such as sugar, exert on production of flavor. In this they have succeeded in obtaining results that promise well.

10. The experiments in progress at Sparta, to restore a worn out sandy tract by the utilization of legumes and rotation of crops, are succeeding well. Lupines and serradella are found to be much better adapted to these highly exhausted lands than any of the clovers.

11. Very favorable results have been obtained upon the heavy red clays at Ashland and Superior by tile drainage and both cereal and forage crops this year show a heavy growth, indicating the beneficial effect of drainage; where phosphate fertilizers have supplemented manure, improved results were also secured.

12. Experimental work on marsh soils at four stations indicates that these soils as a class do not need nitrogen fertilizers, or lime, but that they are deficient in both phosphoric acid and potash. At Marinette this year extremely heavy crops of mixed timothy and alsike clover were secured, the yield on soils where phosphoric acid and potash were used being two to three times the yield of control areas. This means much for central and northern Wisconsin where large areas are well adapted to this crop. The problem of these peat lands is, however, not always a simple one, as at Phillips, soils were found that did not respond readily to this treatment because nitrification is not sufficiently active to insure satisfactory crops.

13. Professors Whitson and Stoddart have studied the influence of soil treatment on the phosphorus content of soils, and the conditions influencing the availability of phosphorus. A method has been devised by Professor Stoddart which permits of the separation of the different phosphate salts in the soil from each other, and field results already show that the combination of phosphates with humus sometimes renders such phosphates unavailable to plants. Ninety-five per cent of the total loss in phosphoric acid on fields continuously cropped, with little or no manure, is accounted for by the crops which are removed. Soils receiving copious amounts of fertilizers, such as heavily manured tobacco soils, receive much more phosphoric acid than the crop removes, but this phosphate excess does not apparently accumulate in the soil.

14. Further experience with the new method of cranberry culture for Wisconsin (recommended by Professor Whitson) consisting of sanding the beds, thorough drainage, and clean cultivation, indicates that the frost problem in cranberry culture is now practically solved.

The temperature of our improved bogs is from 6°–10° F. higher than the overlying air, so that a frost as low as 26° F. can be successfully passed. This practically means immunity from the usual summer frosts.

Special emphasis has been given the last two seasons to the study of insect ravages, and important results in the life history of the more destructive insects determined. Spraying experiments, carried on in cooperation with the department of agriculture, for the control of insect pests, have been unusually successful.

CORRELATION BETWEEN RESEARCH, TEACHING AND EXTENSION WORK.

The ever pressing problem in the development of our agricultural colleges is how to correlate the three main lines of agricultural effort, research, teaching at the college, and extension work throughout the state. The institution that has all three of these lines properly developed with reference to each other, stands on the firmest possible basis. No more important administrative question confronts us than the best possible arrangement whereby these three lines of work can be closely correlated. In the earlier days of the college, the necessity for such coordination was not so great, as the staff was much more limited, but with the ever-widening scope of work, and the continual enlargement of staff to handle this work, the necessity of organization becomes more and more evident.

Some colleges attempt to meet this by providing separate staffs for research, instruction, and even for extension. Such an arrangement, it is feared, will tend to destroy the solidarity of our agricultural work, and while no absolutely fixed policy has been adopted at this college, the tendency toward differentiation in this work is becoming more and more pronounced, but the tripartite division has been on a departmental, rather than a subcollege basis. Several of our departments now have members of their staff that are giving the major portion of their time to research.

Beginning with this year, an apportionment of the funds devoted to the experiment station work has been made, and it is to be hoped that the coming legislature will make provision whereby the work for the state-at-large (extension service) may be put on a distinct but closely coordinated basis.

V. EXTENSION SERVICE TO THE STATE.

The function of an agricultural college is preeminently that of an instrument of the state to aid in all possible ways in the development of the commonwealth. The strength of this college in the past has been in its close touch with the people, and whenever it loses the stimulus that comes from this relationship, its value will begin to lessen. A constantly increasing amount of aid has been afforded the agricultural interests for years by carrying the results of scientific studies directly to the farmer. This work is appreciated in a way that places the obligation of its continuance and development upon us, and the time is now ripe for the organization of our extension activities into more definite and correlated lines. A summary of work now being done is the best proof of its value.

EXTENSION TEACHING.

1. *At the University.*—The continued growth of the ten-day farmers' course demonstrates the wisdom of inaugurating this

method of extension teaching at the university. From an attendance of 175 five years ago, the registration last winter reached 700, from 50 counties and four outside states. More and more it is attracting the most progressive men of the state, and its influence is probably greater than any other line of our work for the time, energy, and expense involved. We find that this brief course is a prominent feeder of our regular courses of study as the farmer thereby becomes convinced of the desirability of an agricultural course for his boys.

2. Throughout the State. During this last year extension teaching has been further developed by the inauguration of cooperative work with some of the county agricultural schools of the state. These schools are struggling to establish themselves in their respective communities, and the agricultural college can and should aid them in this work. Last winter a series of farmers' meetings of several days' duration was held in cooperation with the schools at Winneconne and Marinette. A staff of a half dozen or more teachers from the agricultural college gave a series of lectures, demonstrations, and judging work that was most enthusiastically received. From 400 to 600 persons from nine different counties were in attendance at Winneconne. This work in a way may be regarded as partially equivalent to the farmers' course at Madison in bringing the university into direct relation with many people who are unable to attend the regular winter course at Madison. It is our hope that it will be possible soon to extend this series of meetings so as to include all of the county agricultural schools that are organized.

3. Farmers' Institutes.—The work of the farmers' institute has come to be so well recognized as an integral part of the agricultural educational development of the state, that no extended comment is here necessary. Last year Superintendent McKerrow introduced several new features which were highly successful, such as special lecture work on bovine tuberculosis, and a number of special feature institutes. A tobacco institute was held at Janesville, dairy and alfalfa institutes at Marshfield, and Fort Atkinson, and a potato institute will be held in November this year.

4. Lectures, Correspondence, Etc.—Members of the agricultural college staff have held meetings or assisted in such work by giving lectures in over eighty cases during the last year. The demand for such aid is many times our ability to supply.

A continually increasing amount of correspondence relating to what is substantially extension work, is carried on each year. An approximate estimate for the past year indicates the transmission of about 30,000 letters, besides the mailing of 360,000 bulletins and reports.

DEMONSTRATION WORK.

While much good can doubtless be done by extension lectures, separately or in a series, the nature of the problems attacked is often such that an actual demonstration is the most effective way to present the subject. The eye is the quickest road to the brain, and actual demonstration of a process will often convince where all other means fail. For several years past, the college has been extending its work throughout the state on this basis, and the success of the movement requires further expansion. The demonstration farms at the northern sub-stations, at the cranberry station, and the soil stations, located on the leading types of soil of the state, afford material for scientific study, as well as for the more popular demonstration work.

1. *Potato Spraying.*—The losses from potato blight vary greatly from year to year (10 to 70 per cent actually recorded), but have been severe for three years out of the last four. Proper application of Bordeaux mixture would reduce this loss one-half, and for the last four seasons the station has carried on demonstration spraying work on 200 acres in seven counties in the potato belt. Field meetings, held at the time of application of the spray, and again at harvest time, give opportunity to demonstrate the manner of compounding the mixture, as well as the results obtained. The station furnishes the machines (loaned to us by the manufacturers), the spraying materials, and supervises the work. The farmer furnishes the necessary labor for compounding and applying the mixture, and takes care of the crop. From 30 to 60 bushels increase per acre has been obtained, and it is noteworthy that practically the only portions of the state where commercial spraying is practiced are those in the vicinity of these demonstration fields.

The potato industry of this state is susceptible of wide expansion on the sandy loams of central and northwestern Wisconsin, and it is of utmost importance to induce the growers to spray.

2. *Orchard Spraying.*—This year demonstration work was extended to orchard fruits. Three orchards in Sauk, Richland, and Winnebago counties, have been sprayed with Bordeaux mixture for apple scab, and arsenate of lead and Paris green for codling moth and leaf-eating insects. This work has been supervised by the field expert on potatoes, as most of the orchard spraying requires treatment from early spring to mid-summer, while the potato work runs from June to October. The results of the work have not yet been collected, but much interest on the part of commercial orchardists is reported in those regions where this extension work has been in progress.

3. *Tuberculosis Post-mortem Demonstrations.*—A most striking and successful line of extension effort has been the public slaughter of cattle that have reacted to the tuberculin test. Cooperating with the State Live Stock Sanitary board, public demonstrations were made last year at the state fair (at which at least 10,000 people saw the effects of the disease for the first time), seven county fairs, and a number of exhibitions before the legislature, farmers' excursions, and institutes. The widespread interest thus developed has resulted in wholesale testing, and in some counties from 20 to 50 per cent of all dairy stock has now been examined.

Prior to the inauguration of this work, the station was securing less than a thousand tests per year. This active demonstration campaign was begun in 1906, and the number of station-controlled tests in that year increased to 5,000; in 1907 to 11,000, and last winter to nearly 30,000. The correspondence work connected with this has required the entire time of an expert and two stenographers during the testing season. The reduction in tuberculosis noted is very marked, and the state is now actively reaping the benefits of its precautionary efforts, in that its reputation for healthy breeding and dairy stock is the best in the Union.

During the summer of 1908 a tuberculosis conference was held at Madison, attended by representatives of the live stock and veterinary interests of the upper Mississippi Valley states, at which consideration was given the securing of uniform methods of inspection and control.

4. *Demonstration Farms.*—Three such farms are maintained in the Lake Superior region (northern sub-stations) for testing and for demonstration work applicable to this region, while the

investigations on soils at the five different soil stations are made use of so far as possible. Cooperative relations have been established by the department of agronomy through the state board of control with a number of the farms belonging to the charitable and penal institutions of the state; also the county poor farms. We hope to aid these institutions in developing these farms in accordance with the best scientific practice, and at the same time use them for demonstration work in their communities.

GENERAL EXTENSION WORK.

1. *Pure-bred Seed Dissemination.*—The propagation and dissemination of pure-bred seed grains have been assiduously continued by the department of agronomy. Members of the experiment association have aided greatly in this work, and Professor Moore estimates this year that one-fourth of the oats now grown in the state is of the Swedish Select type; one-third of the barley, Oderbrucker and Manshury, and one-third of the corn is from pure-bred seed. Over a thousand corn centers have been established this year where growers are propagating selected seed secured from the college. This season twenty-six county fairs are pushing this corn dissemination work by special premiums, and encouraging young people's corn growing tests, the seed to be judged at the fairs. At the Dane county fair this year over 800 corn exhibits, grown by young people, were on display. This work has greatly stimulated the interest of young people in farm matters, and offers a sane way to attack the problem of interesting the youth in agricultural education. In a number of counties, school superintendents have aided in this work, thus bringing the rural schools in direct relation with the extension work of the university.

2. *Tobacco Work.*—For the last four years special effort has been given to the improvement of tobacco by seed selection. When this work was begun, there was found to be the greatest diversity in the character of the tobacco grown in the state. Each farmer raised his own seed by leaving a few stalks in the field to ripen. Starting with the best types that could be secured, Professor Sandsten has grown these under special conditions in different portions of the state for the last three years.

Only typical plants have been allowed to mature, and in this period over 2,000 growers have received this improved seed, which is superior in quality, yields well, and the value of which is attested by the fact that at the meeting of the State Tobacco Growers' association this improved stock took the sweepstakes, first and second prizes. Professor Sandsten estimates at the present time that two-thirds of the Wisconsin crop is now produced from this selected seed. Breeding experiments have been under way during this period in order to produce improved varieties by hybridization. Strains have been secured which show a greatly improved leaf, as to size and shape, while the texture and size of vein are much more suitable for tobacco stock. These improved varieties will be ready for propagation and dissemination the coming year. In the work upon curing and fermentation, it has been ascertained that the use of artificial heat in curing sheds will greatly assist in the reduction of tobacco troubles. Heating devices can be installed, at a moderate expense, and traction engines used, to furnish heat when conditions require.

3. *Cooperative Live Stock Breeding Associations.*—A most important move in securing an improved quality of live stock is to induce the farmers to purchase pure-bred sires. Special effort has been directed by Professors Humphrey, Alexander, and Fuller, toward the organization of cooperative breeding associations, by aiding the farmers of a community to unite along some special line of breeding. The success which has been attained by such community effort is most striking. Jefferson county last year sold $600,000 worth of dairy stock; Lake Mills is now the leading Holstein center of America, $175,000 worth of stock having been sold last season to all parts of the world, much of it going to Mexico, Japan, and South America. The college has pushed the matter of organizing these associations with the result that sixteen have been formed for the breeding of dairy cattle, one for draft horses, and one for swine, the most of them within the last two or three years. This work is rapidly making Wisconsin the leading breeding state for dairy cattle.

4. *Drainage Service.*—The demand for aid in formulating plans for the reclamation of wet lands by tile drainage is rapidly developing. The soils department aided last year about

150 land owners by correspondence, thirty-five individual owners, and seventeen drainage districts, by examining and making plans for installation of tile drainage.

5. *Soils Examinations.*—There is also much call for help in the matter of soil management, particularly as to special types, as the marshy, the sandy, and the heavy clay soils. Special aid has been given in about 400 cases in the last two years. Seven cooperative fertilizer experiments on peat soils, with potash and phosphorus, were under consideration this past season. Extension work along these lines would require the entire time of a soil expert, if we were in position to provide the same.

6. *Dairy Tests.*—The extension work in testing officially the milk production of pure-bred dairy stock continues to increase year by year, under Professor Woll's direction. Nearly 1,000 tests were made in 1906–1907, and 1,290 last year. At present twelve supervisors are employed under civil service rules, and the revised schedule on which this work is now performed practically defrays all of the expense connected therewith. The most phenomenal record noted is that of the banner Holstein cow, Colantha 4th's Johanna owned by W. J. Gillett of Rosendale, which produced in one year nearly 27,500 pounds of milk, or approximately eighteen times her own weight. This is the highest authenticated record of any dairy animal.

7. *Butter and Cheese Scoring Exhibitions.*—These are designed to help the factory operator by scoring his product and advising him how to improve the quality of the same. The work is yet new, this being the first full year, but 1,400 samples of butter, from 254 exhibitors, and 778 samples of cheese from 195 makers have been examined and reported upon. Of these, 150 exhibitors have sent in monthly samples at least six or more times. It is noteworthy that the scores of those who are continual exhibitors in this work, are materially higher than the average, and the participants in the scoring exhibitions were the prize winners at the state fair in 1907 and in 1908, and at the dairy conventions, both state and national.

INSPECTION AND CONTROL WORK.

The Wisconsin experiment station is required by law to undertake various phases of inspection work. Inasmuch as this is for the protection of the farmer and thus for the state at large, it is here grouped under the extension service, rather than with the research work.

1. Stallion Inspection.—The attempt to improve the horse industry of the state by licensing stallions, has been attended with much success. The first season's work revealed the fact that of the 3,000 animals used for service, 60 per cent were of grade or scrub origin. The law has only been in operation three years, but a noticeable diminution in grades is already observed. Over 550 have retired from service, and many licenses for unsoundness have been revoked. Several flagrant violations of the law have been found. Fraudulent registry papers have been disclosed, and cases determined where purchasers have actually been defrauded by falsification of records.

This important work of improving the horse industry needs further development, but it is quite impossible for Doctor Alexander to push the same and continue to carry the veterinary and horse work required in the college curriculum. The good example set by Wisconsin was quickly appreciated by other states, as similar laws have since been enacted in five other states.

2. Feed and Fertilizer Inspection.—The work in this department has increased very much during the last year, due to the amendment of the state feeding stuffs law, whereby all mill feeds are made subject to an annual manufacturer's license. The income from this work in 1907 was $2,950, and $5,850 for 1908.

The new feeding stuffs law has been enforced this year under protest of the millers, and a suit has been brought to test its constitutionality in the courts. The law was sustained in the lower court, but it is expected that it will be carried to the supreme court. The necessity for a strict control in this work is recognized from the several important cases of adulteration and fraud that have been discovered. Cases of gross contamination of mill feeds with foul weed seeds and sweepings have been discovered. The beneficial effect of state control is noted, however, in the greatly improved character of feeds now sold in the state, as compared with those which were previously handled.

A most flagrant violation of the fertilizer law was found in the case of one manufacturer who put powdered quicklime on the market and sold it at the rate of $70 to $150 per ton, according to size of package.

3. *Nursery Inspection.*—Over one hundred nurseries have been inspected by the representatives of the horticultural department. and again the San José scale has been found and exterminated. This makes the third time that this dreaded orchard scourge has been discovered in nursery stock by this inspection service.

4. *Seed Control.*—The departments of agronomy and horticulture for a number of years have made numerous tests of seeds, grains, and forage plants, as to purity, germination, etc. The importance of this work is coming to be recognized more and more, as it becomes evident that the yield of grains and forage crops is so largely influenced by the character of the seed sown. This last year over 500 samples of seeds were tested by the agronomy department, and 75 by the horticultural department. among which a number were found to be so badly adulterated and contaminated with noxious weed seeds, that their introduction would have been a serious menace. The whole matter of seed control should receive early attention, and arrangements perfected whereby this can be put upon a proper foundation, so that the farmer can be protected from noxious weeds and adulterations that are now very frequent.

VI. NEEDS OF THE COLLEGE.

This college is forced to engage in such a variety of effort to meet the pressing needs of the state with reference to agriculture, that its wants are many. Although its income has expanded rapidly within recent years, the demand for service is greater than ever. Much of this comes from a radical change in the attitude of mind of the owner and tiller of the soil toward agricultural education and research. Formerly it was necessary to overcome active opposition; now it is a case of supplying the most insistent demand.

IMMEDIATE REQUIREMENTS AS TO PRESENT LINES OF WORK.

Maintenance.—The new courses in university work (remodeled long course and middle course) will require a material increase in teaching staff the coming year. As the distinctively agricultural work is now to be given throughout all four years, classes for the first two years will be materially larger, regardless of the probable increase in number of students.[1] An increase of at least four or five men of the rank of asssitant professor is sorely needed at once, while for part of this instructional work instructors can be utilized.

The increase in government funds given for research in agriculture (Adams fund) compels us also to meet the demands in this direction. Of late years the rapid growth in teaching requirements has necessitated a decrease in research work, but the equities of the case, as well as the opportunities, demand the organization of a research staff, whose members will be in position to emphasize investigational work. There are not more than three or four departments which contain even a single man who is now able to give a major portion of his time uninterruptedly to research. The Wisconsin station has always stood in the front rank in research work, but this position can only be maintained by continued expenditure of energy in this direction. Reliance on our past record will not long maintain prestige.

Attention has already been called to the necessity of organizing our extension service. In no way can the college do so much good for the state-at-large as in a vigorous development of this field. Already this work has grown to a considerable extent—far enough to show its possibilities. This year the legislature should be given an opportunity to support it on a basis that will enable it to be organized and made more effective.

Besides the enlargement of our demonstration work, splendid opportunities for extension instruction are open to us.

Extension Courses Held in Cooperation with County Agricultural Schools.—The state has authorized the establishment of eight of these schools; six are now in operation, or will be next fall. The university should establish the closest relations with these secondary schools. The success attained last year in holding two such extension courses has compelled us to promise to return. Similar courses could well be held at all of these centers; then in other districts in the state, but to carry on this work as a regular feature will require provision for a special staff.

Dairy Factory Operators' and Managers' Course.[2]—The creamery and cheese factory operator in the field has no way by which he can keep up with the times. New methods are constantly being devised; the whole matter of factory management is undergoing a complete change, from the individual to the centralized system. The dairy school is designed more for apprentices, and the man in the field is left without direct help. The need of a brief practical course for the operator is evident. The ten days' farmers' course in February points the way for development. Such a course will bring the factory operator in direct touch with our work and enable him to keep up with advances in dairy factory management.

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[1] The registration in present freshman class (1908) is about three times what it was last year.

[2] Course since authorized by board of regents.

EQUIPMENT.

To handle the work of the college as it stands at present requires material strengthening of our equipment. Moderate outlays with reference to buildings would greatly improve present conditions. It has not been possible to secure allotments for such betterments from special appropriations account for the past two years, because all available moneys are required for the larger items of construction.

The work in animal diseases is brought to a standstill because no available place can be had to house diseased and experimental stock. It is absolutely out of the question to carry on this work in our regular herd barns. With a very large increase in our students that has occurred this fall, material expansion in several departments will be absolutely necessary to take care of the student body. The condition in the soils, horticulture and dairy departments is such that relief must be afforded by next fall, or several of the present courses abandoned. The present laboratory facilities in the soils department afford accommodations for 18 students at a time. The freshman class, now numbering 80, will be required to take this work next year, so that laboratory space for approximately 50 students will necessitate the division of this class into two sections. An extension wing on the soils side of this building will be the most economical method of expansion, and will afford relief for two or three years, when, it is hoped, the horticultural department will be able to vacate its portion of the building for a new structure. The horticultural department is equally congested as to space, not only with reference to laboratory, but more especially greenhouse facilities. Ultimately a new building will be required for this department and economic entomology work, but the most feasible way to relieve the present situation, would be to construct first adequate greenhouse space on the Corry property where the new horticultural building will be finally located. If the greenhouses could be built during the coming biennium, the new laboratory structure could possibly be delayed for a time.

The dairy building was built 18 years ago for winter dairy instruction, and station research. No provision was made for the long course work. The dairy department now has 150 winter course students, and from 180 to 230 students of the short course that take work in farm dairying. From December until April, while the winter course men are in residence, no satisfactory provision can be made for the long course work. There are needed immediately improved facilities for the handling of this work, and this can doubtless be constructed most economically by building an annex over the existing cheese rooms in the rear of the present dairy building.

As soon as conditions permit, the agricultural group of buildings should be connected with the central heating station. Considerable risk is being assumed in attempting to carry this group, including the new animal husbandry building, during this winter, but if it can be done, this connection to the central station might be delayed for another year, as the other improvements are so imperatively needed.

The lease of seventy acres, known as the Koch tract, lying immediately west of the Hill farm, has given a temporary basis for the extension of our seed grain operations. This area will be used largely for the production of pure-bred seeds, and distributed as they are, mainly through the members of the experiment association, the results of this work find immediate expression in the yield throughout the state. No investment will yield larger or quicker returns, and provision should be made for its purchase, so projected improvements can be instituted. Fifteen thousand dollars for the land and $2,000 for fencing, repairing and necessary improvements are required.

Our sub-station work on the peculiar types of soils in central and northern Wisconsin demonstrates the great value arising from the investigations already carried out, but the university owns none of these areas, and all improvements made revert to the lessor upon expiration of our leases. Provision should be made for purchase of small selected tracts, so that further development may not be held in check. Such lands could be inexpensively secured at the present time. A start should be made at once on typical sand and peat tracts. The recent acquirement of the marsh lands immediately west of the university farm furnishes ideal conditions for drainage and soil studies.

To take care of this necessary increase in equipment, almost all of which is immediately pressing, will require allotments from special appropriations account of considerable amount. It is expected that unexpended balances in maintenance funds (when such exist) that may be carried over from one fiscal year to another, will be used to strengthen lines of work already organized, but it is quite impossible to take care of more than minor improvements in this way. The college of agriculture needs at present more than anything else a definite annual fund for general construction purposes. The rapid growth in students compels an expansion of the work, so that facilities are continually over-taxed in existing departments. Development of new lines of work that are much needed has also been postponed because of lack of available funds.

NEW LINES OF WORK.

The following lines should receive consideration by the board of regents as soon as possible:

Agricultural Extension.—The highly successful results obtained in our demonstration extension work make it very desirable that such work be as vigorously prosecuted as possible. The beginnings which have been made along the line of extension teaching, already referred to, warrant the development of this field. It is to be hoped that special efforts will be made this year to secure adequate funds for these highly important lines. Our plans contemplate the correlation of this work with that of the institutes, on the one hand, and the general university extension, on the other. As this is work which returns its cost many fold directly to the state, it should receive special state support. No longer should we use college or federal moneys for this type of instruction.

Poultry Industry.—The most pressing need for a new department is in poultry husbandry. When one recalls that the money value of this industry exceeds that of any other agricultural product, except those of corn, hay, and cotton, it is apparent that attention should be given to its development in a well organized agricultural college. This department has been under consideration for a number of years and a strong demand exists for its immediate development.

Home Economics.—The transfer of this department from the college of letters and science to that of agriculture, and the resignation of the staff, has necessitated the entire reorganization of this work. It is expected that this will be accomplished this current year. Temporarily the department will be housed in the central agricultural building, where sufficient space can be given to the department to make a start. No increase in budget will be needed for the immediate present.

Agricultural Education.—Provision has already been made for work in this line, but so far we have failed to secure a man that is specifically qualified for the work that is most required. In establishing an organic relation with the rural educational system, the college of agriculture possesses a golden opportunity to mold the development of rural life. It should establish the closest possible relations with the county agricultural schools, and the county training schools for teachers, as in this way it can exert the most immediate influence on the rural schools of the state. Moreover, the scope of this work should be broad enough so that it might be of the highest possible significance to all phases of country life. The college should not lose sight of the fact, in the development of the agricultural resources of the state, that it should also aid in the general betterment of rural conditions in economic and social lines.

Forestry.—The demand for forestry continues to grow, and careful consideration should soon be given to the development of this subject. Interest in this question in Wisconsin is becoming more pronounced, and the extensive forest fires of this year are rapidly crystallizing sentiment in favor of actual management of our state forests. Especially is there required the training of forest rangers who will take up the practical problems of actual forest management. Work of this character could be developed in connection with the state forests under the direction of the state forester.

Plant and Animal Pathology.—The losses from diseases of plants and animals is an enormous drain on the resources of the country. Many of these troubles are preventable, and while the college has been of much service to the state through work already accomplished (oat smut, barley smut, potato blight, orchard diseases, tuberculosis, etc.), there is need for continued investigational work. The character of problems requiring solution is so diverse that two separate lines of work are essential, one investigation of plant maladies, while the work in animal diseases should be correlated with the bacteriological and veterinary departments. With but moderate additions, the institution would be well equipped to prosecute researches of the utmost importance to our live stock interests. Provisions for economic entomology should come in the near future. At present the horticultural department is taking care of this work. An expert detailed by the department of agriculture is now engaged in the study of cranberry insects. Apicultural work has been frequently demanded.

Experimental Breeding.—The great value of improved methods of breeding has come to be realized especially within the last few years. While a great impetus has been given this subject through the researches now in progress in a number of institutions, the opportunities for scientific work of the highest order are so numerous that special provision should be made for their development in connection with the work of this college.

Summer Session Work in Agriculture.—The demand on the part of students for work in connection with the summer session of the university is increasing every year. Were it possible to offer facilities for such work with our present staff, it would have been done ere this, but such a course would be exceedingly unwise. While members of the college giving regular instruction during the year are entitled to their vacations the same as other members of the university faculty, almost without exception the agricultural staff is engaged the larger part of the summer on its research work. When an increase in teaching facilities is provided for summer instruction, this demand can be met.

Respectfully submitted,

H. L. RUSSELL,

Dean.

October 1, 1908.

REPORT OF THE DEAN OF THE COLLEGE OF ENGINEERING

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I have the honor to submit herewith my biennial report as dean of the college of engineering.

CHANGES IN THE FACULTY.

It is with great regret that I have to record the death of Professor Storm Bull, in point of service the oldest member of the engineering faculty, and one of the most honored men of the instructional staff of the university. For twenty-six years Professor Bull had served the university with great fidelity, and his death is a distinct loss to the institution and to the many engineering alumni who have come in contact with him.

Professor D. C. Jackson, professor of electrical engineering, resigned in February, 1907, to accept a position as head professor of electrical engineering at the Massachusetts Institute of Technology. Professor G. C. Shaad, assistant professor of electrical engineering, also resigned to accept a position in the same institution.

To fill the position left vacant by the resignation of Professor Jackson, Mr. O. H. Ensign, consulting engineer for the United States Reclamation Service, was appointed professor of electrical engineering in 1907, Professor Ensign still retaining his connection with the government service. Owing to changed conditions in this service, his work as consulting engineer increased to such proportions that it was necessary at the end of the following year for him to resign his position in the university. Following this resignation Professor M. C. Beebe, associate professor of electrical engineering, was promoted to a full professorship in this department. To fill the vacancy left by the death of

Professor Bull, Professor Carl C. Thomas, formerly professor of marine engineering at Cornell University, was appointed as professor of steam engineering.

A department of mining engineering has been established, and Mr. Edwin C. Holden, consulting mining engineer of New York City, was appointed professor of mining engineering in April of this year.

Numerous other changes have been made in the faculty by way of promotion from instructorships to assistant professorships, and by the appointment of additional instructors.

NUMBER OF STUDENTS.

The number of students in attendance in the college of engineering during the past two years was as follows:

1906–7	799
1907–8	921

The growth shown by these figures for the year 1907–8 is the greatest of any year, with one exception, which the college has ever had. The increase in attendance in this college during the past ten years has been about 700, or an average of about 70 per year.

The very rapid growth in the number of students in attendance at the technical schools of the country in recent years, is one of the most striking features in modern education. While this growth will doubtless be checked temporarily during periods of depression, yet it is certain to continue at a comparatively high rate for many years to come, and I believe that we must look forward to an increase of from 50 to 75 students per year for many years. The field of employment for the engineering graduate is constantly widening, and if the instruction is wisely adapted to meet the needs of the country, there is certain to be a constantly increasing demand for the well trained technical graduate.

There is a marked increase in the number of students entering who have spent one or more years in other colleges, and particularly in the various colleges in this state. Arrangements have now been completed whereby four of the colleges of the state are giving instruction in elementary studies in engineering, with special reference to the transfer of their graduates to the engineering college of the university. This cooperation is being carried out with good results to the university and undoubtedly with benefit to the several colleges. It is probably true, also, that the individual student is more likely to take a five or six year course under this arrangement than he would if he should enter the engineering college direct from the high school.

The examination in algebra required of all engineering students has been very beneficial. It has proven effective in causing students to review the subject before entering, and, in particular, it has been helpful in enabling the department of mathematics to separate from the regular students a considerable number of those whose preparation has been deficient and to give special attention to these students. During the past summer session a large number of students took special work in algebra in order better to prepare themselves for the engineering course.

CHANGES AND IMPROVEMENTS IN INSTRUCTIONAL WORK.

Advanced Courses of Study.—One of the most important steps which has been taken for many years leading towards the improvement of engineering instruction, is the establishment during the past year of advanced courses of study in the various branches of engineering. During the past twenty years the development of engineering instruction has been in the direction of a better teaching of the fundamental sciences, and in the extension and improvement of the technical work based thereon. The advance in this direction has been remarkable, and the scientific foundation of engineering practice is now so broad and extensive that in a four-year course the time must be given up almost wholly to mathematics and pure and applied science. The development of the various engineering schools along these lines has been rapid and steady, and the growth in attendance, especially during the last decade, has been very great. The numerous graduates from these schools have steadily won advancement in the great industrial organizations of the country, and, on the whole, it may be said that the schools have, up to this time, fairly met the requirements. The time seems to be at hand, however, when a further step must be taken in the education of the engineer. How shall the desired breadth of training, so important to the engineer, be secured, and with it the necessary training in the applied sciences whose development is proceeding so rapidly? It seems clear that the true professional engineer must be as broadly trained as members of other learned professions.

The subject of the broader training of the professional engineer has received much discussion during the past few years, and various solutions to the problem have been proposed, all of them involving in some form a longer school training. As a result several institutions have recently established courses intending to meet this need more or less adequately. These arrangements have consisted, for the most part, of five or six-year courses similar to those already in operation in this university. During the past year this subject has received the careful consideration of this faculty and, in view of the probable future developments, and especially in view of the migration of students from other colleges to the university, it seemed wise to advance in a somewhat different direction. Accordingly the faculty recommended, and the regents have established, a group of advanced four-year courses, which require for admission one year of college work and which lead to the various professional degrees. The year of college work is to some extent specified, but it is of a nature generally covered by the usual freshman year in the university or in a standard college. In the engineering course advantage is then taken of certain work in mathematics and language included in the preparatory year, so that the course begins at a point considerably beyond that of the present four-year course. This gain in time is made use of to include some additional technical work and also additional general studies, the subject of economics being a required study in the course. While at present the advanced courses are optional, it is believed that it may be wise, in the near future, to make them the standard required courses in the college. Under our rules it is still possible for students to register in the college of engineering for the entire five years, and to secure the same work as required in these advanced courses but in a somewhat different order. This will probably be done by many students who take the entire five years at the university.

The Mining Engineering Course.—Acting on previous recommendations, the regents, in June, 1907, provided for the appointment of a professor of mining engineering and the establishment of a correspondence department. The securing of a satisfactory man to fill this chair proved to be a matter of very considerable difficulty, and it was found impossible to accomplish this in time to begin the work last year. This chair was, however, filled in April last by the appointment of Mr. Edwin C. Holden, consulting mining engineer of New York City. Mr. Holden's education and experience, and his personal tastes, qualify him admirably to fill this position in a very satisfactory manner. A tentative program of studies has been arranged for those desiring instruction in mining engineering, but a complete mining course has not yet been laid out. A reasonably adequate development of this department, together with the work offered by our scientific and other engineering departments, will enable us to give excellent instruction in mining engineering.

Other Changes and Improvements.—Many other changes and improvements of lesser importance have been made in the instructional work during the past two years. The machine shop instruction has been combined with the department of machine design, and all placed under the general supervision of the professor of this department. Inasmuch as the machine shop is, to a large extent, a laboratory relating to the use and design of machine tools, it seemed most appropriate to make this combination. The results under this arrangement have been very satisfactory, and the instruction in the shops, under Superintendent J. C. Steen, has been greatly improved. A similar combination of the mechanical laboratory with the former department of steam engineering has also been made and a combined department of steam and gas engineering has been created. It is believed that this will materially strengthen the work in mechanical engineering. With these changes it is thought that the general organization of the college has been placed upon a natural and effective basis, and one which lends itself most readily to advancement in the several departments.

The system of advisers for freshmen has been made more effective. Additional advisers have been appointed and Professor J. D. Phillips, of the department of mechanical drawing, has been relieved of the detailed work as adviser so as to enable him to devote a larger amount of his time to his work as chairman of the adviser committee.

The equipment of the laboratories has been materially increased during the past two years, especially in the relatively new laboratories of hydraulics and chemical engineering. The laboratory of applied mechanics has also been greatly improved by the completion of a 600,000 pound hydraulic testing machine, which has been designed by members of the college. It is noteworthy that the entire cost of this new machine, designed as above noted, has been about $3,000, whereas the cost of the standard type of machine of like capacity, furnished by manufacturers of testing machines, would be about $12,000. The machine installed here has proven to be very satisfactory and, for all practical purposes, as useful as the more expensive type.

The summer school for artisans has been continued on about the same scale as formerly. While this school meets a distinct demand, the number of artisans who can avail themselves of this work will always be rather limited, owing to difficulties in leaving their employment for so long a period. This school should be continued, and it will undoubtedly prove of increased value in connection with the correspondence work of the university as this is developed.

This year, for the first time, advanced instruction was offered during the summer in certain technical studies, particularly in laboratory instruction in chemical engineering, hydraulics and applied mechanics. The opportunities offered in these laboratories were availed of to a very considerable extent, about twenty-five students taking work in hydraulics and a lesser number in the other laboratories. A considerable number of these students were graduate students and instructors from other institutions. This work should be continued and developed.

GRADUATE AND RESEARCH WORK.

During the past two years there has been a very marked increase in the amount and character of the advanced and research work done in our laboratories by members of the instructional staff, by graduate students and by undergraduates. This work has been very greatly aided by the appropriation of $4,500, which has been available each year for the past two years, this money having been expended in the preparation of material for publication and in the payment of certain special assistants that have been employed temporarily from time to time. The research work thus carried on has resulted in several contributions of very great practical value. These have appeared chiefly in the form of university bulletins, the following having been published during the two-year period:

An Investigation of the Borides and the Silicides, by O. P. Watts.

Tests on Reinforced Concrete Beams, by E. A. Moritz.

A Comparison of the Effects of Frequency on the Light of Incandescent and Nernst Lamps, by F. W. Huels.

Investigation of Centrifugal Pumps, by C. B. Stewart.

Two bulletins on *Plain and Reinforced Concrete,* by M. O. Withey.

An Investigation of the Hydraulic Ram, by L. F. Harza.

Electric Railway Car Lighting, by Edward Wray.

Current Practice in Steam Engine Design, by O. N. Trooien.

Self Excited Polyphase Asynchronous Generators, by L. C. Fussell.

The bulletins already published have attracted wide attention, and have been extensively called for by engineers and builders throughout the country.

Additional bulletins will soon appear from the hydraulic laboratory relating to further tests on the centrifugal pump, tests on the air-lift pump, and tests relating to the economy of turbines. This department, in connection with the hygienic laboratory, has also been collecting valuable data on sewage disposal from various disposal plants in the state.

In the testing laboratory further tests on reinforced concrete have been made, and tests relating to the waterproofing of concrete. These will soon be ready for publication.

In the department of chemical engineering a large amount of research work has been carried on, some of the results of which appear in the following papers by various members of the department. These have been published in the Transactions of the American Chemical Society: By C. F. Burgess—(a) *Rapid Measurement of Electrolytic Resistance,* (b) *The Corrosion of Iron from the Electrolytical Standpoint,* (c) *Problems in the Manufacture of Dry Cells;* by O. P. Watts—(a) *Metals in Order of their Boiling Points,* (b) *Action of Carbon on Magnesia at High Temperatures;* by O. P. Watts and J. M. Breckenridge—*The Preparation of Calcium Alloys for Aluminothermic Work;* by O. L. Kowalke—*On the Conversion of Iron Pyrites into a Magnetic Form;* by A. Hirsch and James Aston—*Alloying of Iron and Calcium.* This department has been working for the past two years under a grant of $2,500 per year from the Carnegie Institution.

The structural engineering department has carried out some rather important tests on plate girders, partly as thesis work and partly as special research work. Results have been published in the Journal of the Western Society of Engineers. The same department has also in charge a very important study of the effect of moving trains on railroad bridges, under the auspices of the American Engineering and Maintenance of Way association. This association has collected from various railroad companies a fund of $5,500 to be used for this purpose, and the work is being carried out under our direction during the summer vacations. This work has been made possible by the development of certain measuring apparatus in our own shops, which has been paid for by the association. Several instructors from this institution have been employed, during the past two summers, on this important work.

NEEDS OF THE COLLEGE.

Buildings.—The most pressing need of the college at the present time is additional space. This need has, in certain directions, become imperative, and, unless provision is made at once for some additional space, it will be impossible to carry out the regular program of instruction with the increased number in the upper classes which we are certain to have in another year. Additional space is needed more especially for drafting rooms, class rooms and offices. Most of the drafting rooms are now being used to their utmost capacity and as many hours a day as practicable, as many as seven different sections being assigned to a single room. This condition is exceedingly unsatisfactory as the rooms are so crowded as to interfere seriously with proper instruction. In the matter of class rooms, also, the efficiency of the work is distinctly decreased by the lack of suitable facilities. With our present large senior and junior classes of from 100 to 150 students, it is essential that two or three large lecture rooms should be available. As it now stands, there is no place where such classes can be held excepting in the large auditorium seating over 300 students. The various offices are also very much crowded, and it is impossible for many instructors to make use of their offices as places of study.

In other respects, also, the present building has for several years been inadequate to the needs of the college. With the growth of advanced and graduate work it is exceedingly important that small recitation, or seminary rooms, be available for this work. Nothing of the kind is provided in this building. It is also exceedingly important that better facilities be provided for the engineering students in the way of reading rooms, club rooms, and departmental or duplicate libraries. I believe that no other single thing would add so much to the proper education of the engineering students as would adequate facilities of this kind. In all recently constructed engineering buildings special provisions have been made for these purposes.

In the matter of laboratories, more space is urgently needed for the laboratories of applied mechanics and the mechanical laboratory. These are housed in the main engineering building and cannot be independently enlarged. Lack of space in the laboratory of applied mechanics makes it necessary to carry on most of the research work in that department during the summer, an arrangement not altogether desirable.

To provide additional space, temporary and partial relief can be had by the construction of the proposed wings on the main engineering building. Considering the proposed change in location of the engineering department in the near future, it would probably be undesirable to construct wings longer than about 50 feet, which is the length of the basement extension already built. These wings would provide relief so far as drafting rooms and offices are concerned, but would not meet the larger and equally important needs of the students above mentioned. At the earliest possible date a new main engineering building should be constructed which should have, at the outset, a capacity at least double that of the present building, and which would probably cost about $300,000. At the same time provision would have to be made for a new building for the mechanical laboratory, which, however, could be of relatively cheap construction. Other laboratories could remain where now located until suitable provision could be made for them elsewhere.

I cannot urge too strongly the necessity of providing some additional space at once, and also the great necessity and importance of providing for a large modern main building at the earliest possible date.

Equipment.—In the matter of equipment, a fair degree of progress has been made during the past two years, the amount available for this purpose being about $20,000 a year. During the next two years an amount at least equal to this should be provided. It is essential to provide the new department of mining engineering with some equipment in ore dressing, and the development of other departments must be continued. The growth in numbers will also require a very considerable expenditure in the duplication of instruments and standard small apparatus.

Research Fund.—I desire strongly to urge that the fund available for research be very considerably increased. No money which has been spent by the college during the past two years has, in my judgment, gone further to improve the work of both instructors and students, and to enhance the standing of the college among engineers and educators, than the money which has been spent on research work. It is not proposed to establish a separate organization for engineering experimental work, as has been done in three other state institutions. Under our organization, it seems best to administer this work as a part of the regular departmental work, for it is believed that in this way it will result in greater value to the students, and will more strongly encourage advanced study on the part of the instructional staff. A very considerable amount of valuable work has been done by students as senior thesis work and the participation of such student in important studies of this kind is of the greatest value in stimulating their interest in the scientific advancement of the profession.

While the amount of money which could profitably be spent in studies of a practical nature is very large, still, if the appropriation for this purpose could be doubled it would place this phase of the work on a fairly satisfactory basis. This would enable many important lines of study to be carried on continuously which are now not touched at all, or are carried on spasmodically, with little return.

Respectfully submitted,

F. E. TURNEAURE,

Dean, College of Engineering.

September 22, 1908.

REPORT OF THE DEAN OF THE COLLEGE OF LAW

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I have the honor to submit the following report concerning the progress of the college of law during the biennial period just closing, together with suggestions for its further development.

During this period a number of changes have been made in the personnel of the faculty by reason of resignations and appointments. In June, 1906, Professor Mack resigned owing to the increasing demands of his law practice. In July, 1907, Assistant Professor Horack resigned to accept a professorship in the college of law, University of Iowa. In January, 1908, Professor Bashford, a veteran member of the faculty, was appointed a justice of the supreme court, and resigned his professorship.

The vacancy caused by the resignation of Professor Mack was filled in April, 1906, by the appointment of Professor Walter Wheeler Cook, department of law, University of Missouri, as resident professor of law. No successors to Professors Bashford and Horack were appointed in 1907–8, the courses given by them being in part omitted and in part assigned to other members of the faculty temporarily. In June, 1908, Associate Professor Moore of the University of Kansas was appointed assistant professor. In September, 1908, John B. Sanborn, Esq., of the Madison bar, was appointed lecturer in code practice. Additional lecturers, selected from the bench and bar of the state, have been selected to present special problems in practice.

Hon. Emlin McClain, LL. D., a justice of the supreme court of Iowa and formerly chancellor of the department of law, University of Iowa, was appointed lecturer for the summer session of 1907.

The faculty now consists of four resident professors and one assistant professor, giving all their time to the college, two professors and one lecturer in law giving from two to four lectures per week.

From forty-eight to fifty hours of instruction per week are now offered as compared with from forty-one to forty-five during the preceding biennium.

SUMMER SESSION.

In April, 1907, the regents authorized a summer session in the college of law. It was deemed advisable in establishing this session to make the work offered in every way the equivalent of that given in the regular session. To accomplish this, a ten weeks' course was instituted. The first session was held in the summer of 1907, and twenty-four hours of work per week were offered. The courses embraced first and second year topics. Instruction was given by the regular members of the faculty, assisted by the Hon. Emlin McClain, for many years chancellor of the law department of the University of Iowa.

The enrollment for the session was thirty-eight, thirteen of the number being students also in the regular session. A very large proportion of the men in attendance were school teachers or superintendents of schools, and the average age of those in attendance was twenty-seven years. These data serve to show that the summer session is supplying the needs of the class of students for which it was primarily instituted, that is, teachers, county superintendents, and others who wish to study law, but are not financially able to sacrifice their teaching position for so long a period. They are now able to obtain systematic instruction in law without giving up their positions. The figures also indicate that an increasing number of students of the regular session are taking advantage of the summer course to shorten the calendar period of residence for the degree.

It is evident that the summer session has become an important factor of the school, and that it will continue to grow in importance as its purposes and advantages are better understood. It will be advisable, very shortly, to increase the number of hours of instruction offered, so that men who have had two years of law will be able to get work in the summer session, which is not possible under the present restricted program.

By recent action of the university faculty, approved by the regents, a degree in law may be conferred either at the October, February or June meeting of the board of regents. This arrangement, coupled with the summer session, introduces great elasticity into the course, and enables students to commence their professional work whenever they complete the requirements for the degree, which was not possible under the old rules.

ATTENDANCE.

The attendance has been as follows:

1906–7	165
1907–8	164
Summer session 1907	39
Total	368
Deducting those twice counted	13
Total attendance	355
Total for biennium (1904–1906)	336
Increase for this biennium	19

This increase is due largely to the summer session, but it is interesting to note that the attendance at the regular session of 1907–8 was only one less than the attendance for 1906–7, and this in the face of the fact that the rule requiring two years of college work was first effective in 1907–8. It is also to be borne in mind, that the same requirements were in force for the summer session as for the regular session.

In the report for 1904–6, it was pointed out that 71% of the students then in the school could comply with the two year prelegal study rule. It was, therefore, anticipated that when the rule became effective, a considerable falling off in attendance would result, but the statement shows that such was not the case. It also serves to show that the requirements are not unreasonably high, and that the students are adjusting themselves to the new arrangement.

The advanced step toward raising the standard of professional education in which this school has been a pioneer in the northwest, has excited much favorable comment and emulation. In 1902–4, three out of ninety-eight schools required only a fair English education; forty-four, a high school education; four, less than a high school; and three, two years in college. In 1908 in the same group of schools, nine require four years in college; seven, two years in college; and four, one year.

The following schools have recently announced a requirement of two years of college work to become effective in the near future: Yale, Boston University, George Washington University; and the Universities of Illinois, Minnesota, Texas, and Washington announce that in the near future one year will be required. The faculty of the department of law, University of Michigan, have unanimously recommended similar action to the board of regents of that institution, and the matter is now under consideration. The committee on legal education of the American Bar Association has twice recommended to the schools that college work be required as preliminary to law study. The president of the Association of American Law Schools in his annual address in 1907, recommended a two years requirement in all schools members of the association, and a special committee of that association is now considering the propriety of making such a rule one of the prerequisites for membership in the association.

At the ninth annual conference of the Association of American Universities held in Ann Arbor, Michigan, in January, 1908, a special committee on the aim and scope of the association reported among other things as follows: "Your committee is of the opinion that the best American universities will in the future rest their professional courses on a basis of college work which shall range from one to four years, and that the professional student shall spend from five to six years in study, from the day he matriculates in the college to the day he receives his professional degree. Your committee accordingly recommends that the association adopt as a second criterion for membership the requirement of one or more years of college work as a prerequisite for admission to professional courses, the combination being so arranged that no professional degree shall be given until the satisfactory completion of at least five years of study.

"Your committee is of the opinion that American universities can not justly be standardized with reference to graduate departments alone; the requirement of a general or liberal education as a prerequisite to professional study, along with an extension of the period of study for professional students being in the estimation of your committee an important consideration. It is of the opinion that American universities should be standardized with reference to these two criteria." This report was adopted by the association and will give a powerful stimulus to the betterment of professional training generally.

These facts are set out at some length showing the general tendency toward higher standards, and the remarkable progress that has been made within a comparatively brief period. Beyond question, the advanced stand taken by this university has served to accelerate the movement. The large number of inquiries received from various schools, concerning the working of the rule here, makes that apparent. It is safe to say that every law school of standing in the United States will within the next five years require at least as long a period of pre-legal study as now obtains in this university.

EQUIPMENT.

For the first time since the erection of the law building, the college of law is in full possession. The rooms occupied for many years by the secretary of the regents and by the university architect have been utilized for lecture rooms and additions to the library, and also for a general reading room. Lockers sufficient to accommodate the present enrollment of the school have been provided.

FEES.

By act of the last General Assembly, the provision of the statutes permitting tuition fees to be charged in the college of law was repealed. By subsequent action of the regents the same incidental fees and non-resident tuition fees that obtain in the college of letters and science. were established in the college of law.

LIBRARY.

The library of the college has been greatly increased since the last report, and now numbers between sixteen and seventeen thousand volumes. This increase was made possible by the special appropriation of $15,000 made by the regents in 1905. The college has a fairly satisfactory library now, but it is by no means complete, and a liberal policy will be essential if it is to be further developed and kept up to the proper standard of efficiency. It must be borne in mind that the library is an important medium of instruction, and bears the same relation to legal education that the well equipped laboratory does to scientific education. In order to keep up the continuations of the various series of reports, and to provide for additions along lines not now covered or but meagerly covered, an annual support fund of at least $2,500 per year is absolutely essential.

COMBINED COURSE.

While two years of pre-legal university study is required for the degree, it is obviously desirable that the student complete the arts course before beginning his legal studies. This would necessitate a total university residence of seven years. Most universities recognize that, in the present state of secondary education, this period of residence is impracticable. Accordingly, it is possible to obtain the arts and law degrees after a total residence of six years. In this university this result is reached through the combined course, seniors in the college of letters and science being permitted to elect part of the first year work in law and count the same towards the degrees in arts and law. The objections to this method are briefly as follows: First, it is pedagogically unsound, since it forces the student to carry at the same time legal and non-legal studies, that bear no relation to each other. The result is lack of interest and efficiency in one group or the other. Second, the student is given full second year standing in the law course on completing only half of the prescribed work of the first year. Third, since the fundamental courses in law on which the more specialized advanced courses in law depend, are grouped in the first year, the student is compelled to complete the omitted courses of the first year. He is thus forced into classes with young men who are just beginning their legal studies, for a portion of his work, and for the remainder, into advanced courses with more experienced students, and without a knowledge of the fundamentals essential to efficient work in such courses. Fourth, it makes it difficult to comply with the rules of the American Law School Association, without seriously interfering with the freedom of election in the college of letters and science. This plan is in operation with some variations as to detail in a few universities. In most of the leading universities, however, the student on completing his junior year in arts is permitted to enter the college of law, and count the first year's work therein towards the degrees in arts and law. This is the practice in the following universities: Columbia, California, Stanford, Chicago, Northwestern and Indiana, and a number of other universities of less note. It commends itself by its simplicity and its avoidance of the objections previously enumerated as incident to the arrangement in force here. If the six years period of residence for both arts and law degrees is to be retained, and its almost universal acceptance indicates that it is, a simplification of the present plan along the lines suggested is most desirable. The plan advocated now prevails in this university with reference to the college of medicine, since candidates for the degree of bachelor of arts may elect the first year's work in medicine and count the same toward the degree.

ADVANCED COURSES.

While the purpose of the college is, and will continue to be, the preparation of students for the practice of law, that should not be its sole purpose. The scope of instruction should be broad enough to cover the field of private and public law as well. The growing complexity of administrative governmental machinery makes instruction in public law imperative. The importance of a knowledge of the historical origin and development of legal doctrine, in throwing light on modern legal problems, deserves more attention than the casual reference now possible. Comparative studies in the public and private laws of those countries, whose judicial systems are based upon the civil law, are of the greatest practical value to the enlightened lawyer or student of governmental affairs. Since it is now impossible for the student to cover the entire field of private law in three years, most of the work in public and comparative law should be offered as advanced courses, for which an advanced degree properly would be given. This is a field into which the American law schools, with few exceptions, have not entered. Some schools, it is true, offer courses in comparative law, but only in the most elementary and unsatisfactory way. In conjunction with the departments of history, political science, and political economy, a thorough course along the lines indicated could be formulated. This college is now offering courses in administrative law, constitutional law, comparative constitutional and administrative law, which form a nucleus for such an advanced course.

Respectfully submitted,

H. S. RICHARDS,
Dean, College of Law.

REPORT OF THE DIRECTOR OF THE SUMMER SESSION

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I beg to submit a report upon the summer session for the biennial period, 1906–8, covering the summer sessions of 1906 and 1907.

ATTENDANCE.

The enrollment has shown a steady growth of appreciation of the opportunities offered in the summer session. In 1904 the registration in letters and science and the summer school of artisans was 387. In 1905 the attendance was 512, in 1906, 549, and in 1907, 648. The following table presents various aspects of the attendance for the biennial period. The figures do not include the students in attendance at the summer dairy school. If these were included the total would be for 1906, 568, and for 1907, 661.

ANALYSIS OF ATTENDANCE.[1]

	1906	1907
Total attendance	549	648
Letters and science (graduate and undergraduate)	455	535
Apprentices and artisans	94	76
Law students	...	37
Graduates	151	170
Undergraduates	193	224
Teachers	229	275
Normal School graduates	110	135
Preparatory students	71	87
Students from Wisconsin	388	436
States and foreign countries represented	34	41

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[1] This classification frequently involves the enumeration of the students in more than one capacity, as, for example, graduates or undergraduates and teachers when they are both.

The value of the summer session in providing increased opportunities for Wisconsin students is shown in the preponderating registration from Wisconsin. The presence, however, of a considerable percentage of students from outside the state has marked value, giving the student body the educational advantages of what may be called cosmopolitanism. The significance of the growing attendance of normal school graduates is obvious.

QUALITY OF THE STUDENT BODY.

It is the general testimony of our own staff and of the visiting professors that the summer students are steadily improving in quality. This is shown, although only in a minor degree, by the increased attendance of graduate students. The undergraduates and teachers not of graduate rank are now of high grade. Formerly students attended who lacked adequate preparation for college work. They came to us probably under the impression that the university offered courses for grade teachers. The presence of such persons, whose needs are now provided for in the excellent summer sessions of the normal schools, is now unusual. It is now well understood that our summer session is a summer session of the university.

CHARACTER OF THE COURSES OFFERED.

In letters and science the university offers regular undergraduate and graduate courses for which a demand has been shown to exist. A few survey courses are offered, especially in the sciences, for teachers who wish to make a rapid review of their subjects, and for regular students, specializing in other fields, who desire a broad education, and cannot afford the time required for a regular elementary course.

In addition to these courses, the college of letters and science has offered, through cooperation with the colleges of engineering and agriculture respectively, courses in art and design and in the elements of agriculture. These courses attract a limited but enthusiastic body of teachers.

The college of law offered ten weeks' summer work for the first time in 1907. The registration, 37, was an encouraging start, and the students in attendance expressed their satisfaction in the opportunity to do one-third of a year's work.

The work offered in the school for artisans is not receiving a proper response. The registration is in part composed of non-artisans who desire practice in the shops and laboratories of the college. If the courses offered were planned with the needs of these non-artisan engineers in mind, I have no doubt that their attendance would increase, especially among manual training teachers. On the other hand, the growth of correspondence work in engineering will, without doubt, render the continuance of artisan courses in the summer essential.

A few pedagogical courses have been offered in the languages, botany, physics, and history. These courses have steadily gained in attendance. The increasing interest of the teachers in the pedagogy of their subjects indicates that the summer session has a great work before it in lending active aid to the improvement of the pedagogical equipment of teachers who have already entered upon their profession.

THE STAFF.

In letters and science, the instructional force for 1906 consisted of 39 professors, associate professors and assistant professors, and 18 instructors and assistants, and for 1907 the corresponding figures were 41 and 19. In the school for artisans the staff numbered 16 in 1906 and 19 in 1907, but in 1907 some of the instructors gave only part time. The same holds true, in a minor degree, of instructors in letters and science. The law school staff in 1907 numbered four professors, including Judge McClain of Iowa.

As a basis for comparisons it may be interesting to recall that in 1899 the summer staff in letters and science consisted of 32 professors and 11 instructors and assistants of various grades, with a student attendance of 341.

The prestige of our summer session is now so well-established that we no longer need the additional attraction of visiting professors from other great universities. As a consequence, the policy has been deliberately adopted of securing outside assistance only when our own instructors are not available. The summer session must stand or fall by the repute of the work of our own men. The improvement in attendance, and in the quality of the student body, indicates that the summer session is standing solidly, and that it will not fall. It is, at the same time, a pleasing duty to record the very satisfactory services rendered by the visiting instructors. In 1906 these were: Miss Jane Addams of Hull House, in sociology; Assistant Professor Bliss of Princeton, in mathematics; Professor Brigham of Colgate, in physiography; Professor Burch of the Eastern Illinois Normal School, in manual arts; Professor Fairclough of Stanford, in Latin; Assistant Professor Lake of Illinois, in art and design; Professor Latané, of Washington and Lee, in political science; Professor Urdahl of Colorado College, in political economy; Professor Van Tyne of Michigan, in history; and Professor Williams of the Platteville Normal School, in mathematics. The visiting instructors for 1907 were: Professor Graves of Missouri, in education; Assistant Professor Lake of Illinois, in art and design; Professor Loeb of Missouri, in political science; Professor Lyons of Indiana, in chemistry; Professor Max Mason of Yale, in mathematics; Judge McClain of Iowa, in law; and Professor Summers of the Oshkosh Normal School, in manual arts. The decrease in the number for 1907 will be noticed.

The circumstance that the members of our own staff do not receive as much cash salary as the visiting professors is of some financial interest.

FINANCIAL ASPECTS.

The cash expenditure at the close of the summer session of 1906, including $3,050, salaries in the school for artisans, was $11,161. In 1907, including $3,150 in the school for artisans and $1,050 in the college of law, it was $12,306.

In addition to the salary payments made at the close of the summer session to various members of the staff, the university, through its leave of absence provision, gave "time" credits to 23 other professors and instructors in 1906, and to 27 in 1907. The salaries of these men, on the cash basis, would have been $5,850 in 1906, and $7,875 in 1907 (including $750 for the college of law).

The income derived from the summer session in 1906 was $8,698 and in 1907, $10,524. Our income will doubtless overtake the cash expenditure very soon.

CHADBOURNE HALL.

Chadbourne Hall was fully equipped with bedding and other ancillary supplies before the opening of the summer session of 1906 at a cost of $469. The net profit in 1906 and 1907, after paying all expenses, and allowing the amount necessary for light and power, covered this initial expense. The attendance of women upon the summer session has undoubtedly been made more comfortable through the opening and full equipment of the hall. It seems certain that the hall, next summer, should show a profit of two or three hundred dollars.

RECEPTIONS.

During each of the sessions of 1906 and 1907 five or six receptions have been given in Chadbourne Hall to the students in attendance upon the summer session. We have no advertising which can compare in immediate return with these receptions.

RECOMMENDATIONS.

Adequate bathing facilities on the university shore of Lake Mendota are very much needed. Summer students take very readily to this delightful form of summer exercise, and the lack of facilities is hurting our progress. I recommend that, if necessary, some arrangement be made with the city for the erection of a public bathing establishment on the shores of Lake Mendota conveniently near the university.

The grounds of the university on Lake Mendota, near the hydraulics laboratory, and also the lower campus, and the open space near the gymnasium, have a shaggy, unkempt appearance in the summer time. It is difficult for the visitor to believe that these grounds are under the jurisdiction of the great university of Wisconsin. A relatively slight expenditure ought to be adequate to put and keep these grounds in proper shape.

The college of engineering should offer a summer session, and in this should be merged those parts of the work in the school for artisans which are in demand. The total cost of such a summer session will exceed that of the schoool for artisans by only a few hundred dollars at most. A summer session in engineering will also give increased flexibility to the work in engineering, and offer desired opportunities to graduate engineers and teachers in technical schools.

The college of agriculture should offer a variety of courses suited to the needs of prospective teachers of agriculture. I realize the great demands already made upon the members of the staff of this magnificent college, but I realize also that our duty to the teachers of the state is imperative. The provisions of the Nelson amendment should enable us to undertake this work in the very near future. It is the most urgent need of the summer session.

Respectfully submitted,

G. C. SELLERY,

Director of the Summer Session.

October 7, 1908.

REPORT OF THE DIRECTOR OF THE GRADUATE SCHOOL

PRESIDENT C. R. VAN HISE,
The University of Wisconsin.

DEAR SIR: In submitting to you herewith my report as director of the graduate school for the academic years, 1907, 1908, it is my pleasant duty to point out that these years have been a period of continued development of the graduate work of the university in respect of numbers, organization and *esprit*. The material facilities for the work although increased in gratifying measure are provided through the college organization of the university and therefore fall outside the scope of this report.

The more advanced work of the university was organized in 1895 as a department of graduate study, almost wholly within the college of letters and science. In 1904 it was advanced to the status of a graduate school covering all of the colleges of the university in so far as they offered graduate work, and administered, at present, by a director and a committee of the university faculty. The growth of the graduate work, since its first organization in 1895, is illustrated by the following summary of graduate students in attendance upon the university in the period between commencement, 1894, and commencement, 1908. For the later years of this period there is given also the attendance of graduate students at the summer session of the university but such data are not now available for the earlier period.

GRADUATE ATTENDANCE.

YEAR ENDING JUNE	NUMBER OF GRADUATE STUDENTS.		
	College year.	Summer session.	Total.*
1895	91	....	....
1896	105	....	....
1897	110	....	....
1898	128	....	....
1899	99	....	....
1900	97	101	184
1901	113	82	183
1902	126	92	203
1903	119	105	206
1904	115	94	196
1905	148	80	218
1906	161	137	272
1907	178	146	312
1908	233	170	379

* Excluding names twice counted.

These figures clearly mark the organization of the graduate school in 1904 as an epoch in the graduate work of the university. While in the decade prior to that period its numerical growth had been inconsiderable, every subsequent year has shown a substantial increase of numbers, averaging nearly twenty per cent, and the total graduate attendance is now approximately double what it was in 1904.

An even more marked increase than that indicated above is shown in the number of graduate students in attendance upon the summer session of 1908, not included above since it falls outside the biennial period covered by this report.

Another standpoint, from which to estimate quantitatively the growth of the graduate work of the university, is furnished by the number of higher degrees conferred annually in course, and a summary presentation of such data is contained in the following table. During the period covered there has been a marked change in the university policy with respect to the granting of second degrees, master of arts replacing in great measure the multiplicity of such degrees formerly conferred. Conforming to this development all second degrees are here grouped in one class, without distinction between academic and professional study:

HIGHER DEGREES CONFERRED.

YEAR ENDING JUNE	Second degrees.	Doctorates.
1892	14	1
1893	14	2
1894	11	1
1895	13	3
1896	20	5
1897	12	8
1898	19	5
1899	18	6
1900	18	5
1901	12	6
1902	23	11
1903	25	4
1904	19	10
1905	34	9
1906	39	9
1907	48	19
1908	71	17

While the increase in the number of doctorates here shown is fairly comparable with the general growth shown in the preceding table, the increase in respect of second degrees is much more pronounced. This in recent years is due, in part at least, to the establishment in 1905–6 of a method whereby candidacy for these degrees may be conducted through attendance upon three summer sessions of the university, supplemented by a substantial amount of work done *in absentia.* The favor with which this innovation has been received is best shown through the fact that about a hundred persons whose professional duties will not permit them to reside at the university during the academic year are at the present time candidates for second degrees upon the basis above outlined. Through inquiry among the teaching staff of the last summer session I am advised that in respect of attainments, diligence and zeal these candidates, partly *in absentia,* compare favorably with the graduate students in attendance during the academic year.

As a basis for further comparison between summer session students and those in attendance upon the semester sessions of the university, I have compiled the following statistics showing the distribution of these students with respect to sex and with respect to the institutions from which they come, the latter comparison being made for the purpose of determining to what extent our graduate students are drawn from other institutions, and to what extent their previous training has lain in the University of Wisconsin:

DISTRIBUTION BY SEX.

YEAR ENDING JUNE.	ACADEMIC YEAR.		SUMMER SESSION.	
	Men.	Women.	Men.	Women.
1902	92	34	62	30
1903	95	24	61	44
1904	97	18	63	31
1905	120	28	46	34
1906	131	30	95	42
1907	149	29	99	47
1908	182	51	105	62

These figures indicate an attendance of graduate women upon the summer session relatively larger than during the academic year. The ratio of women to total graduate attendance seems to be fairly constant, amounting to 35 per cent and 20 per cent respectively for the sessions considered.

DISTRIBUTION OF GRADUATE STUDENTS WITH RESPECT TO INSTITUTIONS OF PRELIMINARY TRAINING.

YEAR ENDING JUNE.	ACADEMIC YEAR.		SUMMER SESSION.	
	U. W.	Other institutions.	U. W.	Other institutions.
1902	70	56	36	56
1903	60	66	38	67
1904	55	60	41	53
1905	76	73	38	42
1906	74	82	57	80
1907	76	100	42	104
1908	95	138	51	116

It is apparent from the above table, that the proportion of students whose undergraduate training has been in other institutions is somewhat greater in the summer session than during the academic year. For all sessions of the university this proportion tends to increase, the growth in the seven years covered in the table being from 50 per cent to 58 per cent for the academic year and from 60 per cent to 70 per cent for the summer session. The entire exhibit may be summarized in the statement that at the present time approximately two-thirds of our graduate students are drawn from other institutions. About forty per cent of the graduate students coming to us from other institutions come from universities comparable with our own in character, while the remaining sixty per cent of such students are from smaller colleges. In view of this large contingent of students from without I renew the recommendation, contained in my last report, that systematic provision be made for at least occasional visitation of a large number of these colleges by representatives of the graduate school, who shall seek to develop there an interest in graduate study, and a desire and purpose to profit by the facilities for such study offered by the University of Wisconsin.

The numerical growth of the graduate school above shown is in part due to the tendencies of the day, an increased interest in academic study which manifests itself at every point in university affairs. It is probable, however, that in considerable part this growth is due to a better appreciation of and better provision for the needs of the constituency from which our students are drawn. To secure this better adaptation considerable changes have been introduced into the administration of the graduate school during the past two years, designed to secure greater flexibility in nonessentials, together with more sharply defined and rigorously enforced requirements of a substantial character. Among these changes the following seem worthy of special note:

Courses in Law and Medicine.—Graduate courses have been established in the colleges of law and medicine which are open to election by any properly qualified graduate student. Similar courses having been hitherto established in the colleges of engineering and agriculture, the graduate work, originally an offshoot of the college of letters and science, now extends to and embraces every college of the university.

Fellowships.—By recent action the scholarship in mathematics hitherto existing has been transformed into a fellowship in mathematics and astronomy and the unassigned fellowships hitherto allotted year by year have been assigned to special departments as follows: One each to romance languages, chemistry, physics, and philosophy and education combined; two to biology and geology combined.

Considerable inconvenience has been experienced in the past through the failure of candidates elected to fellowships and scholarships to enter upon the discharge of their duties, which do not begin until some months after election. A part, at least, of these failures are due to candidates being drawn elsewhere by more attractive offers, legitimate enough in themselves but of evil influence when the candidate has assumed and the institution relies upon definite obligations for the ensuing year. As this is a matter of common interest to many institutions, proposals for a remedy, prepared by myself, were submitted to and adopted by the Association of American Universities in November, 1906. The adopted measures contemplate the nearly simultaneous election of fellows and scholars by all members of the association and prompt exchange of information in the matter, so that the inducements to a candidate to withdraw from an engagement entered into may be reduced to a minimum. In consequence of this arrangement and the assignment of all fellowships as above noted, it has been found expedient to abandon the May election of fellows and to substitute for it an appointment made by a dean upon certification by the department concerned. This appointment should be made about March 24 of each year, but suitable regulations for ensuring prompt certification of the candidates remain to be devised.

Relations with Graduate Students.—Upon the initiative of the Graduate Club the graduate committee has granted to the body of graduate students the right of representation at all of its meetings where questions of policy are to be discussed, such representative being entitled to be heard but not to vote. This innovation unquestionably tends to promote good relations between students and the governing body and meets with my hearty approval.

It has been my duty during the past two years to enforce upon candidates for higher degrees the necessity for more prompt observance of university rules governing their candidacy. This has been particularly the case with reference to the reading knowledge of French and German required from candidates for the doctor's degree. The tendency has been to postpone the absolution of this requirement to the latest date possible and it is only after some friction that it has become recognized as imperative to satisfy the requirement prior to November 1, of the academic year in which the degree is to be taken. By recent action of the graduate committee the initiative in this respect is withdrawn from the student, and the heads of the language departments in conference with the director of the graduate school are authorized to fix specific dates at which the required examinations for this purpose shall be held.

The Graduate Club.—This voluntary organization of graduate students, which for some years has led a rather precarious existence, seems worthy of more university support and encouragement than it has hitherto received. As a means of approaching the student body in an informal manner, of sounding and influencing their collective sentiment and of establishing among them proper traditions with respect to university ideals and policy, such an organization presents unique advantages which a wise administration will seek to utilize. A major difficulty in the maintenance and conduct of the club at the present time is the lack of a suitable assembly room for its sessions and I recommend that provision of this character be made in one of the new buildings, to be used in common by the Graduate Club and other similar organizations. The policy here suggested has long been pursued in the case of debating societies.

Publication of Theses.—The graduate committee has had under advisement the undue delay in publication of their theses manifested by a considerable number of accepted candidates for the doctor's degree. Upon recommendation of the committee the rules regulating the printing of theses have been so amended that the candidate before receiving his degree is required to submit in addition to his completed thesis an abstract of the same, suitable for publication in lieu of the entire document, if so desired, and a standing committee is appointed with power, under proper restrictions, to apply to the publication of the abstract the $50 deposit made by the candidate as a guaranty of publication of the thesis.

Revised Requirements for the Master's Degree.—The university requirements for the attainment of the master's degree having been found ill adapted to the needs of a considerable body of students by reason of a narrow rigidity of prescribed work, they have been revised and restated in a form giving more freedom of choice to the student without abatement of the amount or substantial character of the work required. The modifications of the old requirements consist, substantially, in permitting the candidate to concentrate his work upon a single subject or to divide it between two subjects, without regard to the old prescription of a major and minor occupying respectively two-thirds and one-third of his time. The thesis is no longer an absolute requirement, but rests in the discretion of the department, which may or may not assign one. Undue division and dissipation of the student's energies is precluded by the requirement that at least half of his work shall lie in a single department and that all of it must be approved by that department as properly related to the major study.

Undergraduate Candidacy for a Higher Degree.—The better class of undergraduate students at the middle of their senior year have in many cases absolved nearly or quite all of the requirements for their baccalaureate degree and application is frequently made to the graduate committee to admit such students at once to candidacy for a higher degree. After considerable deliberation and experiment the committee has ruled that subject to the approval of the director of the graduate school such students may receive credit for graduate work done during the last semester of senior year but that this credit shall not be applied to diminish the minimum period of resident study otherwise required for a second degree.

Summer Session.—Conditions sufficiently noted above have already produced very intimate relations between the graduate school and the summer session of the university and the need for additional relations is close at hand. Thus, the administrative work of the graduate school during the summer session is at least as complex and burdensome as during any equivalent period of the academic year. The number of higher degrees voted by the summer session faculty is already considerable and is rapidly increasing. The demand, at present unsatisfied, for graduate courses in agriculture to be given during the summer, must soon be recognized and heeded, as must also the desire of many candidates for the master's degree to use the summer session as a means of obtaining the advanced teachers' certificate. In my judgment it is also a matter of urgent importance in connection with candidacy for the master's degree partly *in absentia*, that the summer session programs be planned with reference to an orderly sequence and rotation of graduate courses. This will require arrangement of the summer session courses, at least in part, for a longer period than one year in advance, and with reference to the relations thus outlined I have to recommend that the director of the summer session be made *ex officio* a member of the graduate committee.

Very respectfully,

GEORGE C. COMSTOCK,

Director.

August 7, 1908.

REPORT OF THE DIRECTOR OF THE WASHBURN OBSERVATORY

PRESIDENT C. R. VAN HISE,
The University of Wisconsin.

DEAR SIR: I beg to submit the following report upon the activities of the Washburn observatory during the period June 30, 1906, to June 30, 1908.

In general, the research work of the observatory has been continued upon the lines represented in my last report, the meridian circle being allotted to Astronomer Flint and the large equatorial telescope to the director.

My personal research work has been given mainly to the determination and discussion of the proper motions of faint stars, and the definitive presentation of the results of the earlier part of this work is contained in Vol. XII, *Publications of the Washburn Observatory,* now in press.

The main results of the work, which I regard as of fundamental importance in relation to a knowledge of the stellar system, may be summarized as follows:

The proper motions of stars much too faint to be seen with the unaided eye, instead of being of insensible amount, as has commonly been assumed, are in fact of very appreciable magnitude, implying that these faint stars are much nearer the earth than has been believed. This proximity is most marked in the regions of the sky remote from the milky way; the average proper motions diminishing progressively with approach to the milky way from either side. The motion of the sun relative to the faint and distant stars here considered differs but little from its motion relative to the nearer and brighter stars, and the nearer and remoter parts of the stellar system have therefore no systematic motion, either of translation or rotation, relative one to the other, such as is sometimes affirmed. As a part of the researches above outlined, I have applied statistical methods to a study of the average mass of a considerable number of slow moving binary stars, and find that in the main the mass of these bodies is considerably greater than that of the sun, although a little less than that of the more rapidly revolving double stars. The extreme slowness of revolution, typical of the stars investigated, must therefore be due to the great distance separating the components of each pair, and this distance, in conjunction with their close angular proximity, indicates that the stars belong to the remoter parts of the stellar system. A detailed presentation of the above results, together with a considerable amount of other collateral matter, has been made in a series of papers presented to the principal astronomical periodicals, and to such typical scientific societies as the National Academy of Sciences and the Astronomical and Astrophysical Society of America. All of the above results have been derived from a series of observations commenced about five years ago and now substantially completed. A second series of similar observations is now in progress, but practically nothing has yet been done toward its reduction or discussion.

Supplementary to the above work, I have employed the large equatorial telescope in the observation of a selected list of binary stars known to be in rapid angular motion. These observations have been regularly maintained for many years, and it is my purpose to continue them so long as my connection with the observatory endures. A volume of such observations was issued in the year 1907 as *Publications of the Washburn Observatory*, Vol. X, Part 3.

Supplementary to my determinations of proper motions, Mr. Flint has employed the meridian circle in a determination of the positions of bright stars required as reference points. The observation list for this purpose includes something more than 400 stars, observations of which are still in progress. The completed results of a similar, but earlier determination, are now in the hands of the state printer, and will soon appear as *Publications of the Washburn Observatory*, Vol. XII, Part 2.

But by far the larger part of Mr. Flint's work has been given to determinations of stellar parallax by the method of meridian transits, in continuation of the series already issued as Vol. XI of the observatory publications. This second series of 124 stars, including all second magnitude stars accessible in this latitude, is now completely observed and the very extended and laborious computations required are so nearly complete that it is hoped to finish and publish the work in the near future.

The time service furnished to the university by the observatory has been regularly maintained, and in consequence of the growth of the university this service has now reached such dimensions as to require a considerable part of the time and attention of the observatory janitor to keep its electrical equipment in order.

Following a custom of many years standing, the observatory is open to the general public on the first and third Wednesday evening of each month and is largely visited at such times, not only by university students but by other persons of all ages and conditions.

The instruments and equipment of the observatory have been maintained in good order, and during the past year the six-inch equatorial telescope has received considerable repairs and improvements, of which the most important is a new steel tube substituted in place of the old wooden one.

The observatory buildings have been maintained in good condition and at present require only moderate repairs for which provision is made in the current budget.

I desire to urge upon your consideration, at this time, the serious damage that may be inflicted upon the observatory as a research institution through the erection of university buildings in its immediate proximity. The college of agriculture and the central heating plant are illustrations of such injurious proximity to which the observatory may properly submit from considerations of the general university welfare. Much more serious damage would result from placing any university building in or near the meridian of the observatory, and I desire to record here my formal protest against such location.

Very respectfully,

GEORGE C. COMSTOCK,
Director.

July 13, 1908.

REPORT OF THE UNIVERSITY EXTENSION DIVISION

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—I herewith present the biennial report of the university extension division.

For convenience, expedition, and efficiency the work has been divided into four departments:

I. Correspondence-study.
II. Instruction by lectures.
III. Debating and public discussion.
IV. General information and welfare.

I. CORRESPONDENCE-STUDY.

It will be appreciated that a system of correspondence-study offered by the university for the benefit of the people as a whole must be comprehensive, both with reference to including the work of all the departments of the institution, so far as practicable, and to covering the widest possible range of grades of study.

The following general classification covers the work as it is conducted:

Regular university grade work.
Special advanced work.
High school and preparatory subjects.
Elementary school branches.
Special vocational studies.

On the first of November, 1906, the first student was registered. On July 1, 1908, there were 1,040 registrations. There are now nearly 1,200 registrations.

The registrations to the middle of September, 1908, are classified as follows:

Regular university grade work	**330**
Special advanced work	**6**
High school and preparatory subjects	**80**
Elementary school branches	**28**
Special vocational studies	**660**

Among those enrolled are laborers, apprentices, farmers, traveling men, skilled mechanics, salesmen, clerks, stenographers, bankers, business men, home-makers, club women, students, teachers, lawyers, clergymen, doctors, and civil officials.

TABULATION OF SUBJECTS AND STUDENTS.

The work offered represents 35 departments of the university and includes over 200 courses of study. The subjects taken by the correspondence students include nearly all that are offered.

The distribution among the more generally chosen subjects is as follows:

Ancient Languages—Latin, Greek	**13**
Business Administration	**70**
Commercial Law	**15**
Drawing	**75**
Education	**22**
Engineering—electrical, mechanical, etc	**163**
Engineering—shop mathematics, etc	**266**
English	**67**
Highway construction	**139**
History—American, ancient, English, United States	**15**
Home economics	**15**
Mathematics—algebra, geometry, trigonometry, analytic geometry, calculus	**98**
Modern languages—French, German, Spanish	**80**
Music	**4**
Natural sciences—astronomy, bacteriology, botany, chemistry, geology, etc	**25**
Philosophy	**5**
Political sciences—agricultural economics, etc	**32**

METHODS OF INSTRUCTION.

The extension division of the university conducts its correspondence work along lines similar to those in use by commercial correspondence schools, so far as concerns the ordinary routine of lessons by mail, replies, and corrections. It introduces, however, a supplementary feature which removes the great difficulty which has always been experienced in educational work conducted at a distance from the instructor, namely, the tendency of students to drop work before completing it on account of discouragement or loss of interest. To remedy this difficulty, the extension division provides instructors who, under given conditions, meet classes of students at regular intervals.

Frequently twenty or more students in the same locality are engaged in the study of the same subject. Under these circumstances, classes are formed and met by an instructor regularly at least once in two weeks. This does not necessarily imply that students must progress at an equal rate. On the contrary, so far as possible, they are grouped according to their abilities, the instructor devoting whatever time is needed by the slowest student. Sometimes students in a locality are taking allied subjects. In such cases headquarters are established, where at times an instructor receives those students who need personal assistance,—the regularity and frequency of these appointments depending, of course, upon the number of students requiring supervision.

The result of thus combining personal relations with correspondence is wholesome from every point of view. The student not only is helped past the seemingly insurmountable points in his studies, but in general is stimulated and encouraged, his interest being maintained throughout. As a rule persons taking this work are earnest and industrious but frequently they are not trained students, and consequently do not acquire easily the results for which their interest and ambition lead them to strive.

An analysis of the tables given in the foregoing pages shows that by far the greatest number of correspondence students are engaged in vocational studies. The course in shop mathematics, for example, taken by 266 men, is written for shop men and deals with shop problems, so applied as to be also preparatory to other specialized vocational studies. The usefulness of classes and personal supervision for the men who take studies of this character is apparent.

INDUSTRIAL TRAINING BY CORRESPONDENCE-STUDY.

It would be difficult, under present conditions, to provide a better means for meeting the persistent and growing demand for industrial training than by the methods of correspondence-study adopted by the university. This fact has been cordially recognized and the work encouraged and aided by employers of men wherever it has been established.

It must be conceded that in the short period since the inception of this work and with meager financial support, comparatively small headway could be made in the way of response to the need which is recognized, yet the results obtained from so much of it as has been undertaken, notably in Milwaukee, point to an immense field of possibilities for the future, and, in fact, the accomplishment in comparison to the means has been enormous.

INDUSTRIAL INSTRUCTION IN MILWAUKEE.

Up to the present time the most important development of industrial study through correspondence supplemented by class work, has taken place in Milwaukee. In this city, that admirable organization, the Merchants' and Manufacturers' association, recognizing the value to their industries of trained workmen, has invited the cooperation of the university in bringing to the employes of Milwaukee firms opportunities for study and self-improvement.

As a result, a number of men employed in manufacturing concerns in Milwaukee have registered for courses of study, and have been met as classes every two weeks by an instructor from the university. The groups have been organized under the auspices of the following firms:

Hoffman & Billings Mfg. Co., The Kempsmith Manufacturing Co., The Bucyrus Co., A. J. Lindemann & Hoverson Co., The Cutler-Hammer Mfg. Co., The Filer & Stowell Co., A. O. Smith Company, and The Vilter Manufacturing Co.

Interest Shown by Employers.—Decided interest has been evinced by these companies in the work undertaken in this manner by their employes. The men have been allowed time from their employment for class purposes, and have been provided with class rooms, properly equipped at the company's expense, in which to meet the instructor. By arrangement between the men and their employers the students' fees are paid by the firm directly to the extension division.

In one instance, wages were raised in order to enable the men to afford the cost of a correspondence course and one-half the fees of a group of apprentices was paid by the company.

In the case of students desiring to drop their studies, employers have assisted the instructor by investigating conditions and advising as to procedure. Consequently, except on account of firms closing or reducing their forces, few men who have begun these courses of study have failed to continue them.

Interest Shown by Employes.—The results attained by the Milwaukee students, who range in age from sixteen to forty years, are remarkable, sometimes beyond the most sanguine expectation. Of those who began work in March, within the four months before July 1, a number had, without losing time from their daily occupations, nearly completed an amount of work equivalent in quantity to the entire course usually covered in a third of a semester.

Several groups of students became so much interested that they organized themselves into clubs, appointed a leader, and met to study together at stated intervals, one group showing a surprising zeal by devoting two evenings a week to this purpose.

Possibilities of Expansion.—This work was begun only last March; eight of nine companies whose attention was called to the opportunity offered by the university availed themselves of it. Those eight companies normally employ about 4,000 men, and during this time of business depression, probably 2,000. From these 2,000, notwithstanding the sluggish financial situation, 263 men enrolled for correspondence-study.

There are in Milwaukee about 210 manufacturing firms, each employing at least 50 workmen, many employing large numbers. An aggregate of over 54,000 men are employed in these larger concerns alone.

If in the course of a few months, during a period of financial depression, 263 employes out of 2,000 desired to avail themselves of an opportunity for self-improvement, what a stupendous result might be looked for if the same opportunity could be brought under normal conditions to 54,000 men.

It should be remembered that the figures mentioned relate only to the manufacturing industry of one city. What might be done for all the industries in every community in the state, with time and means to develop the work, is almost beyond computation; the benefits which accrue to the individual both as a citizen and as an artisan are incalculable, and in proportion as the intrinsic value of the man unit would be raised so would the productive power of industries be increased.

This view of the possibilities of industrial development by means of university extension is not visionary, but is based upon accomplished results in a limited territory among a few representative industries. With adequate support, similar methods of work could not fail to accomplish similar results in every part of the state.

MONEY VALUE OF VOCATIONAL TRAINING.

The training given by correspondence-study to shop men, when cooperated in by the manufacturer, approaches closely to a trade education, and in some respects has advantages over the trade school. The work-room is the student's laboratory, and with a sympathetic superintendent, is an ideal one. If the correspondence instruction is of the right sort—vocational in the broad sense, applying not only to the specific work the man is doing but including allied subjects which will lay the foundation for a wider outlook on life and greater possibilities for advancement—its value is great.

Mr. Dodge, president of the Link-Belt Company of Philadelphia, Pa., shows that the actual money value of training of this sort is large. At the age of twenty-three he estimates the earning power of the shop-trained man at $700 a year and of the trained, at $900 per year. At the age of thirty-two, the apprentice educated in his vocation has increased his annual wage to $1,250, while the untrained man has increased his only to $850. On the basis of 5 per cent, at thirty-two the potential value of the first would be $25,000 and of the second only $17,000. Or, in other words, the wealth of the state is increased $8,000 for every individual who is given vocational training. Roughly estimated, the employes of manufacturing firms in Wisconsin number 250,000 men. If vocational training for one man increases the wealth of the state $8,000, vocational training for 250,000 men should effect an increase of $2,000,000,000. The cost of industrial education becomes insignificant in comparison with results such as these.

PRACTICAL VALUE TO ALL CLASSES.

An idea of the variety and range of work done by correspondence students has been given by the enumeration on page 175, in which is shown the distribution of pupils among the more important branches of study. In order to convey a conception, however, of the evidences of its application, the following mention is made of classes of people who have been and may be benefited by it. Students, who for any reason find it impossible to spend sufficient time at the university to complete a course of study, are given the opportunity to work at home for university credit. Poor boys of ability, through correspondence, gain opportunity to develop special talents. Men of family, married early—before the possibilities of educational equipment consistent with their talents were fully appreciated and recognized—avail themselves of the correspondence-study system and achieve excellent results. Misfits, who having started wrong desire to change their occupations, and men who were deprived of early educational opportunities, are helped to prepare themselves for situations in which they may realize more nearly what they are capable of doing for themselves and for society.

Business men receive valuable instruction and suggestions in the organization and administration of their business. In the case of a certain company an impending failure was prevented, and the company established upon a prosperous basis by the introduction of a system of cost accounting, brought about through the publicity efforts of this department.

Housekeepers and homemakers are instructed in their work, resulting in the introduction of improved selection and cooking of foods and more sanitary living, as attested by the results of the Milwaukee domestic economy study group. The isolated community is brought into closer touch with the inspiration of university thought.

Many instances might be cited of the helpfulness of correspondence-study in keeping the teacher abreast with the times in pedagogical methods, and in adding in various ways to his equipment for usefulness in his community. Professional men, lawyers, doctors, and clergymen utilize the opportunities of this department to a considerable extent. One physician, a graduate of this university and of Rush Medical College, and also for three years the city bacteriologist for Milwaukee, used the department of bacteriology for a special course in immunity and infection. He has expressed himself as gratified with the results of this work, and is enthusiastic over the possibilities of the university in serving the medical profession along these lines.

CREDIT STUDENTS.

The table presented on page 175 of this report shows an aggregate of 330 students taking correspondence-study with the purpose of acquiring units of credit toward a university degree.

Admirable results have been obtained in work of this character. In order to maintain the standards required of resident students the instruction, though it may be carried on by an extension division instructor, is under the general supervision of the department in which corresponding residence work is taught. The same prerequisites are exacted, and the examination imposed at the close of the work is controlled by the residence department.

Those departments of the university in which credit work by correspondence has been completed have been entirely satisfied with the results. So far as known, this is true without exception. Although residence work is the desideratum for students working for credit, yet it is a fact that mature persons who have taken both residence and correspondence work have found the latter more satisfactory in certain branches because in residence the pace of the class is often too rapid to admit of covering thoroughly all of the subject that is required between recitations, while the correspondence recitation need not be made until the preparation is complete. This arrangement, which is necessary of course to persons carrying on employment at the same time with studies, may have decided advantages for any thoughtful student.

STUDENT FEES.

Under present conditions, the correspondence-study department must depend to a certain extent upon student fees for its maintenance. Tuition in a large measure, as well as incidental expenses, must be provided for by this means. As no fee for tuition is charged for students resident at the university, in equity the nonresident students, also, should be exempt from this cost. Furthermore, on the basis that extension shall receive state support in the interest of raising the educational standard of the industrial classes, the fee exacted should be theoretically and actually as low as is consistent with recognition of the self-respect of the beneficiary.

The fee which it has been found necessary to charge is $20 for a five unit-hour study, which should be equivalent to over $100 a year tuition at the university. This is very little less than the fee charged by the University of Chicago, which is not a state institution.

As soon as sufficient support can be had from other sources, the student fee, at least for those taking vocational studies, should be reduced one-half. Registrations and expenses in proportion will increase rapidly with reduced fees, hence the appropriation which could make such reduction possible must be larger many times than the present provision for this department of work.

INSTRUCTORS EMPLOYED.

The number of instructors giving correspondence courses is seventy-four. Until recently they were all regular teachers in the university, employed primarily for the purpose of residence instruction. In order to care for the large number of students in certain subjects, and to provide for meeting classes, it was necessary to secure several teachers to give their entire time to the work. Owing to limited funds available for this purpose, it is possible to engage such teachers only when the fees received from registrations warrant the expenditure.

Extension Division Instructors.—The extension division now employs a teacher in pure mathematics, one in mechanical engineering, one in electrical engineering, the services of an instructor in German four hours a day, and one-fourth of the time of a teacher in history. The employment of a teacher in civil engineering, who shall give his entire time, has been authorized.

My communication to you of March 3, 1908, contains the following observation: "In order to get the desired results, it is necessary to secure, as rapidly as possible, special teachers in practically all of the various lines of work. While the instructors of the university are cooperating with the extension officers cordially, several difficulties confront us. It is impossible, for example, satisfactorily to explain delays to people scattered throughout the state, though they may seem reasonable to those who understand the conditions. The instructors in different departments of the university work have their regular duties. Extension work being extra, is obliged to wait upon other interests. A few delays or other irregularities from this cause react seriously as a hindrance to growth." Those departments of the work which are under the care of teachers who devote their entire time to it are no longer hampered by this disadvantage.

Qualifications of Teachers.—Further argument favorable to the employment of special teachers for extension work was made as follows: "In order that the lessons shall be so prepared as to meet adequately and effectively the needs of the correspondence student it is necessary not only that those who write them shall be thoroughly acquainted with all the conditions affecting the students, but that they shall possess special qualifications. In other words, the work is peculiar, and the men who do it should be selected with reference to their fitness for it. If the correspondence work does not succeed in accordance with our highest expectations, it will be because the teachers have not the proper view-point. This observation applies more especially to vocational subjects and to all work other than that of university or graduate grades. The necessity for having men especially adapted to the requirements of such instruction is recognized by all educators who have had experience in correspondence-study work."

Compensation of Residence Instructors.—It will be necessary for some time to call upon residence instructors in many departments of the university to prepare courses of study and to correct lessons. Considering the special character of the work and the extra burden thus imposed upon teachers without adequate compensation, the results have been exceptional and could not have been secured except for the self-sacrificing interest of those engaged in the work. One instructor, whose habits of accurate accounting for his time are well known, has found that for his services in this instruction up to the present time he has received but between six or seven cents per hour. Other instructors substantiate this record.

An instructor receives three-fourths of the fee charged the student, which should return a fair compensation, but as the labor of preparing the subject matter of the text is as great for one as for many, and the total remuneration depends upon the number of registrations in the subject, the compensation is problematical.

District Teachers.—It will be necessary, as the work grows, to place university teachers in several districts for the purpose of organizing work, meeting classes, and looking after those who need especial help. There are now twelve classes in one subject (about 250 students) in Milwaukee. When that number is doubled, which in all probability will be the case within the next three months, a local teacher should be provided, in the interest of both economy and efficiency.

LABORATORY WORK.

In connection with many of the engineering subjects given in correspondence, laboratory work at the university is now offered. A few days in a laboratory, testing a steam engine, for example, at the end of a correspondence course on steam engines is invaluable vocationally, and any intelligent employer will allow a few days absence to an employe who is in charge of his engines, for such a purpose. At present, work of this kind can be given only when the laboratories are not occupied by residence students. As the work grows, special provision should be made in the laboratories, for these students.

For certain lines of work laboratories located at different centers throughout the state should be established as soon as funds will permit. A fuel laboratory in connection with the course in fuels would be invaluable at present in Milwaukee. This could be used in the evenings and as a branch of the university engineering laboratory could be established at a small cost.

TEXT FOR CORRESPONDENCE-STUDY.

For nearly all correspondence-study subjects it is necessary to provide special texts. The first cost of this work is considerable, and in vocational branches, frequent revision is required in order to keep the lessons up-to-date. This work should be done so far as possible by men on salary in the extension division and by contract for special work. The best texts on vocational subjects for correspondence-study are usually those written by men engaged in professional work, and revised by teachers acquainted with pedagogical methods as well as with the subject matter of the text. Fifty thousand dollars could be spent to advantage for this purpose during the coming year.

An appreciation of the cost of this kind of work may be gained from the following data. A leading commercial correspondence school employs thirty men at a cost of $72,000 annually in paid salaries, for the writing of texts, and expends large sums for special work by contract. The cost of printing, etc., is additional, and an entirely distinct force is maintained for the teaching by correspondence.

BUSINESS ADMINISTRATION.

The enumeration on page 175 of the subjects more generally selected for correspondence-study includes business administration, with seventy students, and home economics, with fifteen. Both of these subjects are now without instructors.

The resignation of Professor Burchell from the university has made it necessary to drop his work for the present. This is especially unfortunate, as the courses he presented were attracting prominent business men throughout the state and the results secured were gratifying.

Although the subjects have been taught in the school of commerce, it has not been possible to find any one to take charge of the correspondence work. The courses are important, and it is desirable that an instructor be secured, who will give his entire time to them, as soon as funds as available.

HOME ECONOMICS.

The subject of home economics lends itself well to correspondence-study, especially when supplemented with class work. A class in Milwaukee under the direction of Miss Huntington evinced a decided interest. Miss Huntington's resignation from the university makes it necessary to suspend this subject until a successor is secured.

HIGHWAY CONSTRUCTION.

The number of students who have taken courses in highway construction is 139. Mr. Hotchkiss, on account of the importance of this subject to the people of the state, wrote the text and corrected the lessons without charge to the students.

Few of the students in this subject would have taken it, if the ordinary fee had been charged. The fact that without the fee, many availed themselves of the course with gratifying results is an index to what might be done in other lines of equal general importance, if funds were available to offer work at a nominal cost.

AGRICULTURE, NATURE STUDY, ETC.

Numerous requests come to the department of correspondence-study for lessons on agricultural subjects. A special instructor engaged to prepare and present short practical courses would find a large demand for his work. One qualified by knowledge and experience to teach these subjects should be extremely useful in assisting the teachers of the state in becoming familiar with the principles of agriculture which they are now required to include in public school courses.

Nature study interests dwellers in city, village, and country alike, and is well adapted to extension teaching. Its value to young people points to the desirability of its early development.

The growing interest in the improvement of town and country by the reservation and laying out of parks, play grounds, and drives, as well as in improved designs for buildings, with reference to beauty, convenience, and sanitation creates a demand for instruction in rural architecture and art. Courses of study treating these subjects, conducted by instructors having suitable equipment of taste and training, are of inestimable value in assisting the general public to an appreciation of the possible attractions and advantages of rural life.

STATE INSTITUTIONS.

With the cooperation of the board of control the extension division might establish useful courses of instruction in state institutions such as prisons, reformatories, etc.

II. INSTRUCTION BY LECTURES.

Although this line of extension work has possibilities for usefulness to the people of the state second to no other, it is believed that satisfactory results cannot be secured by following the methods commonly pursued. During the past year nothing has been done except to meet demands for lectures only so far as they could be responded to with credit to the university and satisfaction to the people, no development of the work being attempted. This procedure has been adopted because it is recognized that it is better to allow the lecture work to remain in abeyance until sufficient funds are available to reorganize it on a proper basis, than to attempt to develop it on lines which, wherever tried, have met with doubtful success.

LECTURE COURSES.

The essentials of successful extension work by lectures are as follows:

First.—Lecturers engaged by the university for this specific purpose, all of whom shall be in thorough sympathy with the work and possessed of gifts qualifying them especially for it, who not only can present their message in popular form but are qualified to study the conditions and interests of localities and so adapt themselves to needs as to appeal to and reach their audiences, intimately. These men shall have no divided interest while engaged in extension work, their whole time, for at least one-half the year, being given to it. They may engage in residence work in the university for short periods in order to keep in touch with it but their first energy and thought shall be given to the outside problem.

Second.—Field organization (described later), by which the state shall be divided into districts, in charge of superintendents who shall cooperate with the people on the one hand and the university on the other.

In New York City courses of free lectures under the direction of the board of education have been exceptionally successful. I quote from a report of this work for 1906–7: "In the lecture season that has just closed 500 men and women have through 5,500 lectures, uttered their messages of uplift, of information, of inspiration and of direction, in 160 different places throughout the city, to an audience that reached a total of over one million one hundred thousand."

In 1907–8 the audience numbered over one million five hundred thousand and the work cost the city $150,000. The population of New York City is three and one-half millions, making the cost of the free lectures of one season a little over four cents for each resident. Reckoning on this basis the State of Wisconsin would need to spend about $100,000 for this department of university extension alone.

Courses of lectures are regarded as a useful means of education for large numbers of people, having special value for adult audiences, in the moulding of public opinion, the formation of character, and in combining recreation with instruction.

III. DEBATING AND PUBLIC DISCUSSION.

The work of this department, though of recent establishment, has gained a remarkable hold upon the people of the state. It is impossible to predict to what dimensions it may grow with sufficient equipment and working force.

GENERAL AIM.

This department aims to arouse and stimulate among all classes of people an intelligent and active interest in important social and political questions. Believing that there is no form of popular education that tends more essentially to the making of good citizens than study and discussion of live issues, the department collects and maintains a loan library of books and periodicals relating to questions of the day, available upon application, issues bulletins on special topics, and keeps in touch by correspondence or personal interview with civic leagues, town councils, library and school boards, farmers' and business men's clubs, high school and academy societies, and all similar organizations throughout the state.

LOAN MATERIAL AND BULLETINS.

The collection of loan material for the use of individuals or organizations, includes only subjects of practical and timely interest, those great questions which are being weighed by the nation or state, and those, of even closer appeal to the citizen, which relate to the municipal policies of his own community. Clippings from newspapers, periodicals, state and national publications, books, in short everything of value bearing upon questions of current interest, dealing fairly and comprehensively with both sides of the discussion, are accumulated by this department and placed at the disposal of those who will use them.

Over twenty-five collections of material upon different subjects have been made and sent out to organizations preparing for debate, or desiring general information. The bulletins, which formulate subjects for debate and give full lists of references on both affirmative and negative sides with information as to where and how this data may be obtained either from libraries, archives or the extension division of the university, are widely distributed. Among the questions presented are *The Election of Senators by Popular Vote, Postal Savings Bank, The Immigration Problem,* and several phases of the "good roads" problem. Collections of material now in preparation present among other subjects *The Guaranty of Bank Deposits, The Commission Form of City Government,* and *Compulsory Arbitration.* The department advises dropping the antiquated questions so popular in the past and grappling in public discussion with the live questions which are before the people for solution.

The bulletins are distributed free of cost, and loan material is supplied, usually without cost and with as little restraint as possible as to time and conditions of use.

In addition to the publications, suggesting subjects for debate, several compact and simple guides have been issued as aids to beginners in the practice of debating. These pamphlets discuss *Debating Societies—Organization and Procedure, Parliamentary Motions,* and *Principles of Effective Debating.* Though designed for the use of beginners, these guides are replete with practical suggestions for experienced speakers and are valued by practiced debaters.

Requests for bulletins from other states than Wisconsin are so frequent, that it has become necessary to put a price upon them for outside applicants.

THOSE TO WHOM THIS WORK APPEALS.

Boys and girls in debating or literary societies of all graded schools, high schools, academies, etc., are making practical and effective use of the direction offered by this department. Among these, eighty-five high schools have used the opportunity to secure assistance and personal advice in their study of questions for debate or of subjects chosen for orations and essays.

In addition to the work with these younger citizens, the department has established and maintained useful relations with various civic leagues, with organizations of farmers and of working men, and with women's clubs. Between October, 1907, and July, 1908, 3,000 people in various organizations received assistance from this department. It has been called upon to assist mayors and members of councils in obtaining knowledge of improvements which have been tried and found successful in other communities.

An important phase of the work applies to legislative problems from the point of view of the voter. The department of debating and public discussion will do for the men who elect the legislators what the legislative reference department does for members of the legislature. The assistance offered by this means is helpful to county boards, common councils, village and town boards, not only in their deliberations upon state questions, but also in their consideration of local questions closely related to daily welfare and comfort.

VALUE OF PUBLIC DISCUSSION.

It is difficult to estimate the value of wide-spread, systematic training of this character in its influence upon the citizens of the state. It is conceded that no other study in the university or college does more to discipline the mind and promote an interest in questions vitally affecting humanity than the work done in debating societies.

It is fortunate that so useful and so broadening a pursuit can be carried on in the home of the student without interruption to his regular occupations. Without other outlay than time and thought the debater is led, first, to feel an interest in and desire to know about the great national and state issues of his day. This point gained, he is taught where and how to obtain material for his studies, a valuable asset in itself, if by this means he acquires the ability to inform himself when and upon what subjects he will. In studying great questions and formulating them for debate he learns to discriminate between fundamental principles and non-essentials. He comes to recognize sound reasoning not only in questions he debates, but in all his reading. In presenting arguments in public he is gaining lessons of self-control, of correct speech, and of concise thinking. That an immense influence may be exerted in countless directions by means of such training spread abroad throughout the state is evident.

IV. DEPARTMENT OF GENERAL INFORMATION AND WELFARE.

It is the object of this department to act as a medium between the great federal and state departments, national societies and state universities, on the one hand, and the people of the state on the other, in the dissemination of results of investigation and research. An immense number of reports are issued yearly which are of vital interest to the public in their treatment of advanced scientific and economic principles and facts.

The latest inquiries of the scientist and of the economist into problems relating to food, hygiene, natural resources, agricultural and dairy processes, household interests, engineering and manufacturing conditions, etc., etc.; discoveries affecting the prevention and cure of disease; labor questions; child study as related to home life, school and play ground; experimentation upon methods of garbage disposal; dust and smoke prevention, etc.,—these and many similar lines of research, tend toward the improvement of the social, educational, and political environment of the individual.

The results of this great accumulation of human endeavor should be brought within easy grasp of those members of the social organization who would be most clearly benefited by them. Unfortunately, however, much of the published data is latent, owing to the fact that the expert investigator frequently has neither training, vocabulary, nor incentive, so to express his facts as to make them available to the general public. There is, therefore, an immense field of usefulness open to the agency which becomes the medium for introducing this store of knowledge to the people to whom it would be of use.

METHODS OF WORK.

The department of general information and welfare gathers this helpful information from every source and publishes it in simple and practical form. It also endeavors to interest people in studying this fund of knowledge and helps them to make use of it. It secures expert advisers for communities having special problems to solve, and answers inquiries upon subjects affecting private or public progress. An effective illustration of its methods is shown in the work done during the past year in its use of the tuberculosis exhibit. This exhibit conveys by means of diagrams, models of ventilating devices, etc., pictures and descriptive text, the following information: First, as to the tremendous loss in this country from this grave disease; second, how individuals and families may protect themselves against infection; and third, the best measures to be taken for the care of infected persons.

This exhibit was sent last year to eight cities in the state under conditions which attracted general attention. An expert demonstrator who interpreted and supplemented its graphic lessons accompanied it.

PUBLICATIONS.

As rapidly as means permit, bulletins, monographs, and leaflets are being printed and distributed. An admirable pamphlet on the fireless cooker has been issued which should result not only in greater economy in the use of fuels, but also in the better preparation of many foods. The department has in press a comprehensive bulletin upon *The Prevention and Cure of Tuberculosis,* another upon *Frosts in Wisconsin,* and the best methods of guarding against injury from them in the spring and fall, and several others of equally practical value.

It will be seen that by the methods adopted, this department is bringing directly to the people at little or no cost to them and by such means as enlist their interest, the great discoveries and advances in knowledge, to which experts and specialists are devoting their efforts the world over.

BAKERS' INSTITUTE.

A practical example of what may be done for artisans through the agency of the extension division in arousing interest in improved methods and conveying instruction in available form is seen in the Bakers' institute, planned in response to a request from the bakers of Wisconsin for practical, scientific information applicable to their industry.

A convention in which experts in food chemistry and practical bakers will take part is to be held in Milwaukee the latter part of October. The United States Department of Agriculture evinces its interest in this move by sending Dr. Cobb, an authority on wheat, and Dr. Winton, a flour expert, of the United

States Food and Drug Inspection laboratories, to assist in the work. These specialists, and the eight other instructors whose names appear on the program, are believed to represent the most advanced results of research in their departments of work. Their instruction should be invaluable to the men who will attend the conference.

The attention of the baking industry of the entire United States is directed to this enterprise as it represents the initial move in the effort to instruct the craft in the scientific principles underlying their trade. An encouraging feature of the undertaking is the fact that the initiative came entirely from the bakers themselves. Over one hundred and twenty-five of them pledged themselves to attend a conference conducted by the university. The extension division welcomed this opportunity believing that though legislatures and Consumers' leagues have been united for years in the demand for pure foods, yet no legislation or consumers' campaign could possibly accomplish such comprehensive reforms as must result from an intelligent seeking on the part of the producer himself for increased knowledge and improved methods. (The program of work carried out by the Bakers' institute is submitted as a supplement to this report.)

STATIONARY ENGINEERS.

As an evidence of interest shown by organized labor in university extension, the results obtained in work with the stationary engineers are notable. Their state organization carries out educational plans of its own devising, and the extension division has been able to be of assistance to it by means of lectures, correspondence-study and advice.

Recognition of the value of extension for such organizations is expressed in the resolutions passed by the National Association of Stationary Engineers at their recent meeting in Denver, in which the work of the extension division of the University of Wisconsin is commended and the delegates are instructed to endeavor to secure legislation in behalf of establishing similar work in other states. A copy of this resolution is submitted as a supplement.

FIELD ORGANIZATION.

As university extension is intended to disseminate all the benefits offered by the university to persons not resident at the institution, it is necessary that such an organization be developed throughout the state as will enable the extension division to reach the people in the most effective and helpful manner. It should be understood that it is the desire of the university to reach not only those who feel the need of assistance but also those who, not realizing a need, may upon learning the possibilities for self-improvement open to them through the several departments of extension be led to avail themselves of the opportunities thus offered.

Districts.—In order to accomplish this end it is proposed that the state be divided into districts, and that in each of these districts there be established headquarters in which a representative of extension shall be located. Ideally, this center should be in connection with the public library of the locality and the natural assistant to the representative of the university extension division would be the librarian. A magnificent work could be done by librarians educated especially for such duties. The training now prescribed in library courses would need to be supplemented but little to enable its students to study, under the supervision of a trained chief, the social and economic conditions of their communities, and to take an active part in developing interests of all kinds tending toward improvement in various relations of life. Extension, working through the agency of such members of every district in the state, could adapt its services to the needs of the people of every community more exactly than would be possible by other means. All departments, whether of correspondence-study, of instruction by lectures, of debating and public discussion, or of general information and welfare, would do their work with knowledge of the conditions as to people and places otherwise difficult to obtain. In a word, from the library as a center, the influence of the university in all its phases, representing every possible benefaction which the university offers, might be spread over every community in the state.

It is not absolutely essential, of course, that the library be made this center. If it is not, however, some other center must be provided, and as the machinery of the library is already in existence, and as the training and position of the librarian are such as to enable him to be of use, the library would seem to be—from the point of view of economy and effectiveness—the natural headquarters for this work. In connection with these headquarters, local laboratories, such as described elsewhere in this report, should be established and the library lecture rooms could be utilized for class purposes for correspondence groups, as well as for lectures.

Cooperation.—Through these centers, arrangements would be made for lecture courses, reading courses, correspondence courses, special exhibits and demonstrations (as, for instance, the tuberculosis exhibit which the extension division is now sending through the state); also conventions on topics appealing to special industries, occupying a day, a week, or more. The library boards, public school boards, and town councils would naturally cooperate and be actively helpful in forwarding all educational movements, it being clearly understood, however, that it is not the object of the extension division to usurp the prerogative of these bodies, but to assist them, and if possible add to what they are doing, in ways compatible with their interests and plans.

Advisers.—A useful function of the university district representative should be that of adviser to boys and girls in the selection of their life work. Such an adviser would need to be especially qualified by gifts of judgment and sympathy to deal with and exert an influence upon young people in the formative stages of their development. No attempt could be made to select occupations for those advised, but assistance would be given in carefully canvassing the field and choosing wisely and with forethought the work for which they are best fitted.

One need only examine into what has been done in Massachusetts by the Vocation Bureau, which has been in existence less than a year, to appreciate the possibilities of this work. This bureau was founded in January, 1908. Since that time a large number of men and women, ranging from fifteen to seventy-two years of age, have applied to it for assistance, and have received available help. The bureau renders its services free of charge, many influential men and women being interested in its support. Its essential usefulness consists in helping the applicant, "first, to know himself; second, to consider wisely the requirements, opportunities, prospects, etc., to be found in different lines of work; and third, to reason truly on the relations of these two group of facts."

A striking illustration of the need for selection has been shown recently in Cincinnati. At the university, where a combination has been made with the manufacturers whereby students in mechanical and electrical engineering courses may spend alternate weeks in the university and the shops of the manufacturers, the applications for these courses reached last year as many as 2,000. As only a limited number could be accommodated, some process of elimination and selection was necessary. A thorough investigation of the qualifications and aptitudes of the different applicants for the courses disclosed the fact that but a small percentage had any natural bent or real inclination, when the work was understood, for the profession or occupation selected. In other words, knowledge of the qualifications essential for the specific lines of work had been so vague and meager that choice had in reality been made in the dark, and upon understanding conditions the applicant found he no longer desired what before had seemed to be especially attractive.

Those who have had experience in college work know how many students enter courses of instruction only to find that the work is not what they expected, and that their abilities and tastes lie in other directions. Such young people are fortunate if their losses are not more serious than those resulting from delay and expense.

To prevent misfitting in the choice of vocation should become a useful part of extension work. It is a practical means for assisting the young citizen to improve his efficiency and attain for himself the best possible conditions.

NEEDS.

For the proper development of the work of the university extension division in the manner outlined in this report and based upon the expansion of the present organization the needs may be enumerated as follows:

For the field organization, which is essential to the development of the four departments, the state should be divided into eleven districts and a university extension representative be employed for each district. Each representative should have at least two assistants.

In each district a central office should be opened, preferably in connection with a convenient public library, other public libraries in the district becoming branch centers.

The number of the districts, representatives, and assistants should be increased as the work demands it.

Only by a system of this nature can the opportunities which the university offers to the people of the state, be satisfactorily made known and all its resources be made effective.

In order to secure the best results it is essential that permanent headquarters be opened in the cities where there are a large number of extension students. Ordinarily, these offices would be the district centers. Such an office is now much needed in Milwaukee where the registration numbers 539.

Provision should be made, as promptly as possible, for the establishment of local laboratories. The character of these laboratories depends upon the needs of the locality, and they supplement the correspondence work in those subjects which require laboratory instruction in night classes. Where high school laboratories are available the expense for this purpose will be small. These laboratories will in fact be branches of the laboratories of the university, whether in engineering, hygiene, chemistry, physics, or agriculture.

In the correspondence-study department the needs are great. As noted, there should be an independent faculty for this work, and the faculty should be made up of men with special qualifications. As the character of the text is vital and since there must be a text for every course as soon as one student takes it, teachers who would make this work their first consideration, and who possess the other qualifications required, should be secured as soon as possible.

Twenty-one teachers should be added to the present university extension faculty at this time and more will soon be needed. A large increase in the clerical force will be necessary.

In the department of debating and public discussion the secretary (secretaries being the executive heads of departments) should have in addition to stenographers and clerks, two assistants trained in library and investigation work to aid in preparing bulletins and collecting loan material (described in this report).

To develop the work in the department of instruction by lectures, ten lecturers, possessing special qualifications (enumerated in report) should be secured. A secretary also is needed for this department.

For carrying on the work of the department of general information and welfare as outlined, a secretary, a library-trained assistant, a clerk, and a stenographer are needed. Funds should be provided also for the preparation of bulletins, monographs, etc.

The results secured during the past year have been extremely encouraging, and were possible because of the excellent pioneer work that had been done before.

Mr. Lighty laid out the work of the correspondence-study department in the first year of its inception on a broad and comprehensive basis, with such care of the details as to make the growth a matter largely of expansion. His past experience, his belief in the work, and his devotion to it have been invaluable.

Mr. Hutchins brings to the departments of debating and welfare an intense sympathy for mankind and an exceptional appreciation of the democracy of education, without which his work could not have attained its present importance and success.

Great as are the possibilities for good in this work, it is peculiarly true that the workers must be in thorough sympathy with it or disappointment will result. But with enthusiasm and fitness in its workers and the appreciation and support of the people of the state, no movement can prevent this division from adding to what President Eliot has called the greatest state university in the country, that element which will make it, in truth "The People's University."

Respectfully submitted,

LOUIS E. REBER,
Director, University Extension.

October 1, 1908.

REPORT OF THE LIBRARIAN

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

DEAR SIR: I have the honor to submit the following brief report on the growth and condition of the university library for the biennial period ending June, 1908:

GROWTH.

The total number of bound volumes in the general university library and the departmental libraries accessioned with it, on June 15, 1906, was 97,378. By June 15, 1907, this number had increased to 106,840, and by June 15, 1908, to 119,920. This gives a total of accessions, for the biennial period, of 22,542. This total of accessions exceeds the accessions of the preceding biennial period by 4,600, and is the largest increase the library has ever experienced in any two years. This statement of increase does not include the library of the college of law, which now number 16,000 volumes, an increase of about 3,000 volumes during the biennium, nor the Woodman astronomical library at the Washburn observatory, which now numbers 2,600 volumes. The total strength of the university library and all its branches at the present time is estimated at 135,000 volumes and 36,000 pamphlets.

The continuance during the biennium of the increased book purchasing fund has made it possible for the library committee to continue the policy adopted several years ago for the development and building up of the library. In general, the larger part of the fund has been devoted to the purchase of sets of periodicals, and other expensive sets of fundamental importance, which are constantly becoming rarer, and consequently more expensive. The purchases of the past two years have helped greatly to fill the gaps in many lines, but there is little, if any, diminution in the demand from nearly all departments for an increased library allotment.

Individual acknowledgment of thanks is given for all gifts as received. A few of the more important gifts of the biennium perhaps deserve mention. Through the agency of the American Bureau of Industrial Research, there has been received as a gift from William E. Walling, of Chicago, a collection of 234 volumes, dealing with foreign social movements. In my report of two years ago, mention was made of the gift from James J. Hill, of St. Paul, of $5,000 for expenditure in the development of a library on transportation. In the spring of the present year, Mr. Hill made a further gift of $2,000, thus making a total gift for this purpose of $7,000. The purchases from this fund, together with gifts from railroad companies and others along the same line, have already made our collection of books on transportation one of the most extensive and notable in the country. This railroad collection is now being catalogued, which will, of course, make it more available for the use of students and others. Two other important gifts have just reached the library and should have brief mention here, although they have not yet been accessioned. Through the liberality of Mr. William E. Walling, of Chicago, the American Bureau of Industrial Research has purchased the private library of Mr. Herman Schlueter, of New York, and has presented this collection to this library and the library of the Wisconsin State Historical Society, division to be made along our respective lines of collection. A great part of this private library consists of material on European social movements, and will doubtless prove a valuable supplement to the collections along this line already available here. From the library of the late Henry Demarest Lloyd, of Chicago, the university has received, as a gift from his heirs, a large collection of pamphlets, reports, and newspaper clippings, dealing with co-operation, anti-imperialism, New Zealand, and other social and economic questions in which Mr. Lloyd had special interest. While the library welcomes these larger gifts, it is not less thankful for the smaller gifts of books and pamphlets, which are constantly being received from alumni, members of the faculty, students, and others. I regret that limitation of space forbids an enumeration here of all of these gifts, as well as the more important accessions by purchase.

CATALOGUING DEPARTMENT.

The cataloguing staff during the two years has kept well up with the current accessions, and has made some progress in recataloguing in certain sections. The head cataloguer reports that 9,493 volumes were catalogued in the year 1906–7, and 11,781 in the year 1907–8. Figures such as those just given do not, of course, adequately show the amount of work done, as any given volume may be represented in the card catalogue by many entries. So far as they are available for our use, this library continues to purchase printed catalogue cards from the Library of Congress, thus materially reducing the cost of cataloguing the works for which such cards can be obtained. At present, we are of course able to secure cards for only a small proportion of our accessions. As the card stock of the Library of Congress increases with the passing of years, we will of course be able to secure printed catalogue cards for a larger proportion of our accessions.

LOAN AND REFERENCE DEPARTMENT.

The reference use of the library increases gradually year by year with the growth of the university and the constant development of reading courses. Statistics as to recorded loan and reference use have practically no significance, owing to the freedom given in the unrecorded use of books in the reading rooms, seminary rooms, and stacks. The Wisconsin state historical library, located in the same building, supplements the university library at many points, and is of course largely used by members of the university. It has been possible of late years, with an enlarged and experienced loan and reference staff, to give much better service in this department. In a university library no service is more worth while than the giving of expert assistance at the reference desk and the training of students to help themselves. During term time the library is now open from 7:45 a. m. to 10 p. m. daily, except on Saturdays and Sundays. On Saturdays the library closes at 9 p. m. for the weekly cleaning of the reading rooms.

Notwithstanding our growth, we constantly find it necessary to borrow material from other university and reference libraries, for the use of instructors and advanced students. Unless the books are needed for actual class use, all transportation charges are ordinarily paid by the person for whose benefit the books are borrowed. The university is under obligations to many institutions for such favors. To some of these same institutions and to others, we have frequent occasion to loan from our collections. The library loans to other libraries, or educational institutions, for the use of individuals, and not ordinarily to individuals directly. Both libraries are especially glad to be of service to the college and public libraries of Wisconsin, and these libraries apply to us frequently for loan of books and bibliographical assistance.

RELATIONS WITH STATE HISTORICAL SOCIETY.

The relations of the university library with the Wisconsin state historical library, in the same building, continue to be of the most cordial character. While the libraries are distinct in management, it is aimed to conduct the two libraries, so far as the public is concerned, as one great state public library, open to all who would make use of its resources. The fields of collection of the two libraries, both by purchase, exchange, and gift, are kept distinct by careful cooperation. The greatly increased use of both libraries has shown the wisdom of bringing the libraries under one roof. The library of the Wisconsin Academy of Sciences, Arts, and Letters, a valuable collection of reports and transactions of learned societies, comprising about 5,000 volumes, and located in the same building, is becoming of increased service to scholarly workers here and elsewhere. It is hoped during the coming year to make a beginning in the cataloguing of this library, incorporating one set of the cards in the card catalogue of the university library, and thus rendering it of greater usefulness to our readers.

NEEDS.

In regard to the pressing needs of the university library, I can only reiterate what I said in my report of two years ago. One of the two most important needs of the library for the immediate future is the continuance of a liberal book purchasing fund. While our growth in the past few years is gratifying, the work of rapid development must be continued, if the library is to prove adequate to the needs of the university. It is a matter of regret to all interested, that it was found necessary to so greatly reduce the book purchasing fund for the coming year, and it is hoped that this is to be only a temporary setback in our growth. In many fields our library collections are hopelessly inadequate for university work. While great progress has been made, the library is still inferior to the libraries of most of those sister universities, with whom the University of Wisconsin is proud to compare herself in equipment and work.

The library was removed to the new building eight years ago. In that period, the general university library has grown from 55,000 volumes to nearly 120,000 volumes, an increase of almost 120%. In the same period, the historical library has grown from 108,000 to over 150,000 volumes; in other words, over 107,000 more bound volumes are stored in the building than when it was first occupied. At all points the storage capacity of the building is severely taxed. This makes evident the second great need of the immediate future, viz., the construction of the northwest stack wing. In the original plans of the building, this stack wing was provided for, but it was omitted necessarily, but regretfully, through lack of sufficient funds. At present all the shelving in the building is crowded, and there is no space for additional shelving. Only by constant readjustment are accessions accommodated, and the crowded condition constantly interferes with the free use of the library by readers, as it has been necessary to remove sets of books from their proper places to inconvenient places in the basement. Even if the construction of the wing is provided for by the next legislature, the question of caring for books will become a very serious one for both libraries before the wing can be completed. This enlargement of the library building is certainly one of the most urgent needs of the university today. No one thing, perhaps, means more at this time in the development of the university, both for the present and the future, than the rapid growth of its libraries. To care for this growth properly and thus to make readily available to students the book resources, render the additional stack wing an urgent necessity of the immediate future.

Respectfully submitted,

WALTER M. SMITH,
Librarian.

June 30, 1908.

REPORT OF THE DEPARTMENT OF PHYSICAL TRAINING

PRESIDENT C. R. VAN HISE,
The University of Wisconsin.

SIR:—Two years ago the department of physical training was given charge of all out-door athletic work as well as indoor sports and compulsory gymnasium drill.

The conference legislation of the previous spring in the matter of football had dampened the ardor of the students toward the new regime. In spite of this almost one hundred men played football. During the year 1906–7 in addition to the compulsory gymnasium classes the number of men enrolled for the various intercollegiate sports and interclass teams was 537. The total registration in the various forms of physical training in 1907–8 was 1,394.

The system of election of sports, instead of the class drills, has been inaugurated and finds favor with the underclassmen, and attracts an increasing number of upperclassmen. Thirteen electives are now offered to those physically fit for them.

Particular mention should be made of the introduction and growth of indoor baseball with twelve interclass teams, and relay running with two hundred men participating. Rowing has received great impetus from the organization of two rowing clubs, open to all, and for whose use the regents acquired and remodeled the large boathouse. The purchase by the athletic council of a fast and able launch, capable of carrying twenty persons, safeguards the oarsmen in time of sudden storms.

While intra-mural sports have been growing, intercollegiate games have been carried on under the reforms created by the conference universities. The control of intercollegiate games with the questions of eligibility, policy, and financial management, is vested in the faculty and conducted by its committee, the athletic council. Candidates for teams must attain the promotion average of scholarship. Expenditures are incurred only on approved requisition, and full report of receipts and expenses is made annually. After an intermission of one year one big football game with Minnesota was played in 1907. The game was free from the hitherto objectionable features and for 1908 two are approved.

The staff of three, two years ago, has been enlarged by the addition of an instructor in aquatics and one in outdoor sports. The accession of an instructor and two assistants in gymnastics and floor work, in place of an assistant professor, makes it possible at this time to establish the much needed office of medical examiner. Dr. Elsom, appointed to this office in June, will devote his attention to medical and physical examinations and supervise the training of underdeveloped and asthenic cases.

The urgent needs of the department are a building for physical training exclusively, and greater subdivision of compulsory gymnasium classes which will be possible only on a floor always at the disposal of the department. Aside from the present difficulty of furnishing adequate attention to individual physical needs, caused by sharing the armory with the military department, and the consequent exclusion from the floor for many hours daily of those who wish to exercise, the hygienic principle involved in locker rooms without sunlight, and the introduction of septic material to the main floor by street apparel of audiences and the regiment is too serious to be deferred.

Respectfully submitted,

C. P. HUTCHINS,

Director.

September 15, 1908.

REPORT OF THE PHYSICAL DEPARTMENT FOR WOMEN

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—Education for health and efficiency is the object of the department of physical training for women. The work of the department is organized to that end.

At the beginning and end of each year of the period, a course of lectures was given to all students of the department on "Value of Physical Training," "The Relation of Physical to Mental Life," "Poise—Mental, Moral, Physical," "Nutrition and Food and Exercise," "Personal Hygiene," "Public Hygiene," and kindred subjects, designed to direct the attention of the women to the possibility and desirability of attaining and maintaining health and strength, if the most is to be made of the time spent at the university, and if the most is to be made of life in all the years to come.

Each year every woman on entering, is examined as to health and strength, and her anthropometric measurements are taken. On the basis of her measurements, strength tests, and health record, the director of the department advises with each student personally, indicating exercises, recreation, mode of life, etc., which are adapted to her needs. (Each one is examined twice in her freshman year, and again at the close of the required work of the second year.)

The floor-work, out of door sports, and games are conducted with a view to development of strength, health, good carriage, and a high standard of physical efficiency.

For those not in fit condition to profit by the work of the regular classes, special classes are formed and individual prescriptions of exercise are given. Decided improvement is usu-

[illegible] result. Those having spinal curvatures and other postural defects are given special work in corrective gymnastics.

A normal course in physical training, theory and practice, is given to enable the young women to take up volunteer classes in gymnastics and games in the high schools to which they go. The emphasis of the normal course is upon the teacher's responsibility for health and carriage of students. Unfortunately this sort of work is not given or required in the high schools generally in the state, so regular teachers of physical training are not employed but teachers find opportunity to introduce the work if they have had some training for it while at the university.

The Women's Athletic association was organized as an honor society during the biennial period, and is a factor in keeping the ideals of the department before the women. It admits to membership only those who are "all round gymnasium girls," grants honors only to those of ability in several lines, and admits to office only those who, in addition to excellence in gymnastics, are satisfactory in their hill studies.

For the period covered by the report the total number enrolled for 1906–7 was 385, and for 1907–8, 418. Classes held numbered 325 and 509. There were 180 freshmen in 1906–7, as against 250 in 1907–8. There were respectively 300 and 325 lessons in corrective gymnastics given for those unable to profitably take class work, or for those having postural defects which exercise would aid in correcting. About 30 each year need special work. The number enrolled for sports, including hockey, basket ball, bowling, baseball, tennis, rowing, and maypole dances was 270 in 1906–7 and 550 in 1907–8.

The regular floor work is carried on from the middle of November to the first of May, the aim being to keep the large majority at work out of doors for at least two months of the school year. This could better be done if we had more facilities for outdoor work. We have no adequate field for hockey; we need six or seven more tennis courts to accommodate the large number desiring to play; a boathouse for women is a necessity if rowing is to be undertaken. The lack of level space is our greatest handicaps. However, with the tennis courts at our disposal some 60 beginners were taught tennis each spring.

Rowing was attempted in the spring of 1907, but owing to the weather, and the difficulties of a public boathouse with not enough boats for our use when they were needed, the attempt was not repeated in 1908, being considered as too wasteful of the time of teacher and pupils. With a boathouse for women, rowing ought to be one of our chief sports, useful as well as recreative, after we get into the new gymnasium which will enable us to teach all to swim.

The work of the year is closed with open lessons, and in 1908 these took the form of an evening of folk dances, and women's fete day, in which all the women of the university were asked to join the students of the department, some 200 of whom danced in the maypole dances. About 700 women took part in the fete on the upper campus. Many requests have come that the fete be made an annual affair. It was first held as one of the exercises of the jubilee program.

Pieces of special work are undertaken each year. Those in the years of the report included the compilation of a bibliography of all material in the university and historical libraries, whether in book or article form, on the subject of physical training; a comparison of health status for the two year period which showed general and decided improvement in functional disorders and postural defects; and for the purposes of the tuberculosis exhibit at Washington this fall (1908), a compilation and charting of the statistics of the anthropometric measurements of students in this department for a period covering the last ten years. The charts were sent on by the state board of health, whose statistician prepared them. One interesting fact brought out was that throughout the period, the young women were stronger each year at entrance, and their measurements were higher, at the beginning of each successive year, than the measurements of the incoming class of the year before. The statistical summaries show that there has been every year a decided gain, at the close of a year's training, over the measurements on entrance, and a marked increase by the end of the second year. These gains were in chest girth, chest expansion, lung capacity, shoulder breadth, and weight. There were corresponding gains in the other measurements which we take, but the above were tabulated as significant for the purposes of the tuberculosis exhibit. Another thing which appeared was that the work in gymnastics removed abnormalities, that is, the curves were smoother at the end of a year's training than at its beginning. Thus it is proved that in the department the state has a factor in the prevention of tuberculosis, as making for health and physical development.

A movement must come for physical training in all the schools of the state, and this will require in the university the arrangement of regular courses for the training of teachers in the work of this department. Another development will undoubtedly be a "health test" for teachers going out from the university. Health will become an asset of obvious value to those intending to teach, and the opportunities of the department will be sought throughout the four years by an increasing number of students.

Respectfully submitted,
ABBY SHAW MAYHEW,
Director.

REPORT OF THE DEPARTMENT OF MILITARY SCIENCE AND TACTICS

PRESIDENT CHARLES R. VAN HISE,
The University of Wisconsin.

SIR:—Pursuant to instructions I have the honor to submit herewith the report of the military department of this university covering the period from June 30, 1906, to date, with recommendations concerning the same.

The scholastic year 1906–7 was the last year of the administration of this department under Capt. C. A. Curtis, U. S. A., retired. Briefly stated, the regulations in force at the close of that year were: (1), All able bodied male freshmen and sophomores required to drill; (2), Excuses from drill were granted on the grounds of previous military service or physical disqualification, and to aliens, adult specials, men working their way, athletes, and normal graduates; (3), Hours for drill, 5–6 p. m., two days a week until April 1, and thereafter four hours a week.

The corps of cadets was organized as follows:

1	**Regiment of 2 battalions of 3 companies each**	**470**
1	**Artillery detachment, 2 guns**	**19**
1	**Target detachment**	**31**
1	**Hospital Corps**	**21**
1	**Band**	**31**
		572 men.

All of the above organizations were permanent, rifle practice being given only to the target detachment of 31 men.

On August 9, 1907, I was detailed by the war department to fill the vacancy caused by the death of Captain Curtis, and reported for duty on September 26 of that year. I took charge of the office with a full appreciation of the excellent work done by my predecessor, and a determination to make no radical changes in the system developed by him until that system had been thoroughly tested. Two changes were, however, necessarily made at the beginning of that year. First, artillery drill was dropped, the guns and equipment having been turned in to Rock Island arsenal before my arrival, by order of the war department. Second, each of the two battalions was increased by the addition of one company, this increase being natural in view of the larger size of the student body. No change was made in the regulations for the department during the year 1907–8. The organization at the close of the year was as follows.

1 Regiment of 2 battalions of 4 companies	576
1 Hospital Corps	42
1 Band	33
1 Target squad	4
	655 men.

Practically all sophomores were assigned to the target squad at some time during the year.

Besides the regular drills, recitations and lectures were held one hour a week throughout the year for cadet officers, and a class of non-commissioned officers was held by the commandant on Saturday mornings, for further instruction of men particularly interested in the work. The results of this latter instruction were interesting. About 40 students voluntarily reported regularly, and nearly all were candidates for lieutenancies this year.

The present scholastic year has commenced most auspiciously for this department. An assistant has been allowed the commandant, Sergeant Major W. G. Atkins, U. S. A., retired, an excellent man, 47 years of age. He does all the clerical work formerly done by student assistants, as well as most of the work of caring for arms and equipment. Without doubt he should be permanently employed by the university in his present capacity. Commandants are changed frequently, and there may even be times when the university is without a commandant, but this man, being a fixture, would always be able to maintain the continuity of work in the military department. The cadet uniform has been changed from the old style U. S. A. pattern to a neat cadet uniform. A printed pamphlet of regulations for the department has been issued, containing all necessary instructions for students and others interested. The university band is now under a competent student leader, makes better music than heretofore, and has grown much in popularity. An indication of increased interest, most pleasing to the commandant, was the fact that 71 candidates tried for lieutenancies this year, as against 35 last year.

It is the intention of the commandant to make the work more interesting and more instructive this year than heretofore, by varying the routine drills in the spring by the introduction of practical problems in advance and rear guards, outposts, and attack and defence.

It does not seem out of place in this report to point out briefly the value of military training in this as well as other universities. It aids the individual, by giving him an erect, manly bearing, and some knowledge of the management of men. It is of value to the university in that it teaches the student respect for authority, and the necessity for discipline. Its greatest value lies in the reserve power it gives to the state and the nation. While we all hope that our nation may never become involved in a great war, there is no assurance of this. If such a war should come, the nation must rely for its fighting strength not on the regular army or the national guard, but upon volunteer troops raised in the various states. The entire organized military strength of the United States is not more than 170,000 officers and men, (regular army 65,000, national guard 105,000,) scattered throughout the United States and our outside possessions. Modern wars are fought with large numbers of more or less skilled troops. In the battle of Mukden alone there were approximately 310,000 officers and men on each side. A generous sprinkling among our people of educated men who have some knowledge of military tactics is therefore essential, if we would avoid national disaster in case of war.

RECOMMENDATIONS.

I most urgently recommend that steps be taken at the earliest possible date to provide adequate facilities for the work of this department. As pointed out in a special report from this office last year, the present fine gymnasium and armory is ample for any one of the uses to which it is now being put, armory, gymnasium, or auditorium. But the military department can use this building only from 5 to 6 p. m. on four days a week, and much of this time is lost through the frequent use of the hall as an auditorium. Under these conditions, the results obtained can be only mediocre, and discouraging in the extreme. I need not dwell on the unsanitary condition resulting from the use of the same hall for both drill and gymnasium purposes, as this phase has undoubtedly been reported upon by the athletic department.

The only solution of the difficulty lies in separating the two departments, and this involves providing a new building for one or the other.

Should the military department be given the exclusive use of an armory building, much good would immediately result. Drill periods could be so arranged as to avoid the present crowded conditions, and each individual would learn far more than he learns at present. Theoretical instruction would be practicable, without using more time than now. Hours could be so arranged as to accommodate a large number of the students now excused on the ground of working their way. The work would be far pleasanter, as well as more profitable for students, and I do not doubt but that instead of being considered a "grind", it would be looked upon with pleasure. The present unpopularity of military drill in the university is due more than anything else to the overcrowded condition. It is practically impossible to drill 300 men at one time in a hall even as large as ours, and to have those men look forward to such a drill with pleasure.

While by far the greater part of our drill must take place indoors, the best results can be obtained only outside. The lower campus is small and is used for many other purposes. Should a new armory be constructed, it should be located near an available drill ground, presumably Camp Randall.

Another great need of the military department is a rifle range, not less than 300 yards in length. I have endeavored to locate a suitable place for such a range, but so far without success. I sincerely hope that such a place can be found in order that our students may receive better instruction in the use of the rifle than is possible in a gallery.

Respectfully submitted,
RALPH McCOY, U. S. A.,
Commandant.

REPORT OF THE UNIVERSITY EDITOR

PRESIDENT C. R. VAN HISE,
The University of Wisconsin.

SIR:—I have the honor to submit the following report upon the progress of the division of publications, during the biennial period closing June 30, 1908.

CREATION OF THE OFFICE.

In the spring of 1907, the board of regents established the position of university editor. This action was taken because of the rapid increase in the number of monographs published in *The Bulletin of the University of Wisconsin.* The monographs thus published embody the results of research and investigation in science, engineering, political science, political economy, history, and philology and literature. It is of the utmost importance to the university that they be published promptly and in the best possible form. This was impossible, however, when the work of editing and preparing for publication the issues in the bulletin was left to members of the faculty, in addition to their regular duties. In order to facilitate this work and obviate the delays to the publication of researches and investigations, an editor was appointed. This appointment was tendered to me by the board of regents in the summer of 1907, but I found it impossible to take the office until December 1, 1907. This report, therefore, is confined chiefly to that part of the biennial period beginning December 1, 1907.

DEVELOPMENT OF THE DEPARTMENT.

Upon assuming the duties of this office, I found about twenty manuscripts on hand, some of which had been on the waiting list for more than two years. My first task, therefore, was to get these monographs published with the least possible delay. By the end of June, sixteen out of the twenty were published and the others set into type. This makes it possible to begin the new year with a clean slate and to publish forthcoming numbers of the bulletin without delay.

One of the first tasks that confronted me was that of organizing and systematizing the work of this office so that the routine of editing and proof-reading could be done as efficiently as possible and without confusion or complication. This has been done.

As soon as the printing of the old manuscripts was well under way, the problem was taken up of concentrating all of the publications of the university, (not including those of the college of agriculture) into this division. The publication of the general catalogue, the departmental announcements, the high school series, the university extension bulletins, and the syllabi used in class room and laboratory instruction, was taken over as part of the regular work of this office.

It is aimed to develop *The Bulletin of the University of Wisconsin* along the lines that will redound to the greatest advantage of the university and of the state. It is believed to be of the greatest importance that the results of research and investigation carried on in the various departments of the university be published and distributed freely, in order that they may render valuable aid to other investigators, and furnish instruction to those who are interested in the pursuit of knowledge, besides giving material assistance to individuals who may find occasion to apply these results to practical problems. It is towards these ends that the development of the bulletin is directed.

With regard to the progress of this division, I beg to submit the following information, covering the amount and character of the material published in *The Bulletin of the University of Wisconsin:*

Economics and Political Science Series.—This was formerly part of the economics, political science and history series which was discontinued with the completion of the second volume, in 1899, and replaced by the economics and political science series and the history series. Nine numbers have been issued in this series since it was started in 1904; seven of which appeared during the period covered by this report.

History Series.—This series was started in 1899. Since then four numbers have been published, two of which were issued in the last biennial period ending June 30, 1908.

Philology and Literature Series.—This series began in 1898. Twelve numbers have appeared since then; three in the last two years.

Science Series.—The first number in this series was published in 1894. Since that year a total of eighteen numbers has been issued, three within the last two years.

Engineering Series.—Started in 1894. Since then thirty-one numbers have appeared, eight within the last two years.

University Extension Series.—This series was formed in 1908. One number has been published. In this series will appear papers, reports, and contributions that do not fall naturally within any of the other series, but that contain information of direct interest and value to the people of the state. Its contents will be of a more popular nature than is found in the other series. It is designed especially as an effective medium through which information of a scientific or educational character may be presented to the public in such form that it may be readily applied in a helpful way to present-day problems. It will help to carry the influence of the university to the state at large.

Unclassified Numbers.—It was discovered that valuable contributions to knowledge were being prepared by members of the university faculty, which would not naturally fall into any existing series of the bulletin. For this reason it was thought desirable to publish these occasional studies in a separate class, which has been designated simply "unclassified." The publication of these unclassified monographs was started in 1908. One number has appeared.

With these two additions to the regular series it is believed that a channel is now open for every scientific or literary contribution prepared within the university, which may be considered suitable for publication.

General Series.—This series comprises the general catalogue, the alumni directory, the departmental announcements, the bulletins of the University Extension Division, and all bulletins issued for administrative purposes or for university records. A detailed report of the numbers issued in this series is included in the report only for the year ending June 30, 1908, since prior to that time they were not edited in this division. During last year, eighteen numbers have been issued in this series, through the division of publication.

High School Series.—A new series of the bulletin was started in 1906, called the high school series, which contains a number of manuals designed to assist secondary school teachers in the presentation of the subjects included in the high school curriculum. Two numbers in this series have been published and a third is now ready for the printer. These manuals have proven of great assistance to high school teachers throughout the state.

Alumni Directory.—The last directory of officers and graduates of the University of Wisconsin, issued in the general series of the bulletin, was published in 1907. In a few years it will be necessary to publish a revision of this directory bringing it up to date. The preliminary work of keeping a complete record of alumni and former students of the university has been started in this office and a card catalogue of all such persons has been made and will be revised and brought down to date as soon as provision can be made for the necessary clerical help. If this work is done thoroughly, it will give accuracy and continuity to the alumni records, and greatly lessen the labor of publishing the next and subsequent directories.

Syllabi.—The work of editing and publishing syllabi to be used in class-room and laboratory instruction is now done in this division.

University Letter-Heads.—A standard form of letter head for university correspondence has been worked out and accepted by the various departments. The standard provides for Tiffany Gothic type and for 20 pound Crane's Japanese linen paper, except where a different paper is desirable for a special purpose, and for the omission of all names from the heading, except for administrative officers. This has resulted in economy and in uniformity. It gives me pleasure to report that the heads of the various departments cooperated most satisfactorily in bringing about this desired standard.

The development of the science, the economics and political science, the history, the engineering, the philology and literature, and the university extension series of the bulletin is indicated by the following table, showing the number of issues that have appeared in these six series during each biennial period since July 1, 1892:

From July 1, 1892 to June 30, 1894	3
From July 1, 1894 to June 30, 1896	13
From July 1, 1896 to June 30, 1898	7
From July 1, 1898 to June 30, 1900	11
From July 1, 1900 to June 30, 1902	7
From July 1, 1902 to June 30, 1904	8
From July 1, 1904 to June 30, 1906	8
From July 1, 1906 to June 30, 1908	22

Following is a list of the numbers issued in each series of *The Bulletin of the University of Wisconsin*, during the biennial period July 1, 1906 to June 30, 1908; giving size of edition and number of pages of each:

No.	Title.	Edition.	Pages.
	ECONOMICS AND POLITICAL SCIENCE SERIES.		
142	A History of the Northern Securties Case, by Balthasar H. Meyer	2,000	135
182	The labor contract from individual to collective bargaining, by Margaret A. Schaffner	2,000	181
183	The financial history of Wisconsin, by Raymond V. Phelan	2,000	293
198	The labor history of the Cripple Creek District, by Benjamin M. Rastall	2,000	166
211	A congressional history of railways in the United States to 1850, by Lewis H. Haney	2,000	272
221	Economic influence upon educational progress in the United States, 1820 to 1850, by Frank T. Carlton	2,000	135
242	A financial and administrative history of Milwaukee, by Laurence M. Larson	2,000	182
	HISTORY SERIES.		
149	Lincoln's suspension of habeas corpus as viewed by Congress, by George C. Sellery	2,000	73
220	The settlement of Illinois from 1830 to 1850, by William V. Pooley	2,000	309
	PHILOLOGY AND LITERATURE SERIES.		
143	Latinitas and Hellenismos: the influence of the Stoic theory of style as shown in the writings of Dionysius, Quintilian, Pliny the Younger, Tacitus, Fronto, Aulus Gellius, and Sextus Empiricus, by Charles N. Smiley	1,600	67
163	The indebtedness of Samuel Taylor Coleridge to August Wilhelm von Schlegel, by Anna A. Helmholtz	2,000	97
188	German literature in American magazines, prior to 1846, by S. H. Goodnight	1,000	264
	SCIENCE SERIES.		
138	The joint system in the rocks of southwestern Wisconsin and its relation to the drainage network, by Edmund C. Harder	2,000	39
158	The Pre-Cambrian volcanic and intrusive rocks of the Fox River valley, Wisconsin, by William H. Hobbs and Charles K. Leith	2,000	31
207	The organization of certain coenobic plants, by Robert A. Harper	1,500	56

No.	Title.	Edition.	Pages.
	ENGINEERING SERIES.		
145	An investigation of the borides and silicides, by Oliver P. Watts	2,000	67
148	Tests on reinforced concrete beams, by Ernest A. Moritz	2,000	75
157	A comparison of the effects of frequency on the light of incandescent and Nernst lamps, by Frederick W. Huels	2,000	51
173	Investigation of the centrifugal pumps; part I, a discussion of the theory of the centrifugal pump and tests of a six-inch vertical centrifugal pump, by Clinton B. Stewart	2,000	141
175	Tests on plain and reinforced concrete, series of 1906, by Morton O. Withey	2,000	70
197	Tests on plain and reinforced concrete, series of 1907, by Morton O. Withey	2,000	66
205	An investigation of the hydraulic ram, by LeRoy F. Harza	2,000	111
216	Investigation of flow through large submerged orifices and tubes: part I, experiments with submerged tubes 4.0 feet square, by Clinton B. Stewart	2,000	84
	UNIVERSITY EXTENSION SERIES.		
217	The fireless cooker, by Ellen A. Huntington	2,000	38
	UNCLASSIFIED.		
136	A study of the influence of custom on the moral judgment, by Frank C. Sharp	2,000	144
	GENERAL SERIES.		
212	Catalogue	17,500	661
	Departmental Announcements:		
206	Department of Romance Languages	2,000	15
203	College of Law	4,500	24
200	Summer Session	20,000	84
213	Professional Courses in Engineering	2,000	16
218	Graduate School	1,300	185
222	School for Artisans	4,500	14
226	Department of Public Speaking	1,000	6
227	Education of the Modern Engineer	5,000	12
228	Long and Middle Courses in Agriculture	5,000	16
229	Courses Preparatory to Journalism	2,000	24
230	Library Training Courses	3,000	25
233	List of Accredited Schools	1,000	13
234	School of Music	1,000	28
223	Departments of History, Political Economy, and Political Science	3,500	46
237	Courses in Dairying	6,000	16
231	Department of English	2,000	29
235	Course in Chemistry	1,200	19

No.	Title.	Edition.	Pages.
	HIGH SCHOOL SERIES.		
170	The high school course in English, by Willard G. Bleyer (two editions)	3.000	60
174	The high school course in German, by M. Blakemore Evans	1.000	30
	SYLLABI.		
	Syllabus of general survey of English literature	500	8

From the above tabulation, you will observe that during this period the number of issues in each series of the Bulletin is as follows:

Economics and political science series	7
History series	2
Philology and literature series	3
Science series	3
Engineering series	8
University Extension series	1
Unclassified	1
General series	18
High school series	2
Syllabi	1
Total	46

NEEDS.

With regard to the needs of this office, I beg to suggest the two following as the most immediate and pressing: (1) larger quarters, (2) additional office assistance.

Owing to the crowded condition of the university buildings, it has been necessary during the past year to confine this department to one small room in the basement of university hall. This room is not half large enough to accommodate the office force and the equipment necessary to carry on the work expeditiously. The rapid increase in the amount of work passing through the office, makes it imperative that additional room be provided.

The recent development of the bulletin, due to the increased amount of research and investigation in the various departments, together with the other work of an editorial nature assumed by this division, makes it necessary that additional permanent assistance other than that afforded by occasional student help, be furnished. The publication of the various series of *The Bulletin of the University of Wisconsin* now more than taxes the present force, and further development is impossible without clerical help. The preparation of material for the alumni directory will be sufficient to occupy a large part of the time of one person. The increase in the attendance at the university and the growth of the graduating classes have greatly augmented the work involved in compiling the information in regard to alumni and former students of the university necessary for this directory, and such a clerk would insure accuracy and continuity in these records. The importance of keeping alumni and former students in as close touch as possible with the institution by means of the alumni directory and other publications, cannot be overestimated. Such additional assistance, too, would make it possible to distribute the university publications from this office, which would result in economy of labor as well as in the development of a mailing list that would insure the distribution of the bulletins to those persons most likely to derive benefit from them.

Great progress has been made toward the concentration of all the university publishing in the division of publications. More remains to be done along this line, however, and it is desirable, in the interest of economy and efficiency, to do this as rapidly as possible, so that all issues of *The Bulletin of the University of Wisconsin* will be handled through this division.

Respectfully submitted,

F. W. MACKENZIE,

University Editor.

September 30, 1908.

REPORT OF THE EDITOR OF THE PRESS BULLETIN

President Charles R. Van Hise,
The University of Wisconsin.

Dear Sir:—I have the honor to submit the following brief report of the work and development of the University Press bulletin during the biennial period ending July 1, 1908.

PURPOSE OF PRESS BULLETIN.

The University Press bulletin was established by action of the regents in April, 1904, and the first copies were issued at the opening of the university year in September, 1904. The purposes of issuing the bulletin, as set forth at the time of its establishment, were: First, to give to the citizens of the state through the medium of the daily and weekly newspapers the results of the research and the investigations that are being carried on at the university; Second, to keep the public informed in regard to the educational work of the university, and the constantly increasing opportunities for study in many fields offered by the university to the young men and women of the state; Third, to furnish accurate reports to the newspapers of the official news of the university, including the meetings of the regents and the faculty, and the work of officers of the university generally. These aims have determined the character of the bulletin and the direction of its development and growth.

DEVELOPMENT AND WORK.

The bulletin is sent at regular intervals to five classes of publications: (1) Wisconsin daily newspapers; (2) Wisconsin weekly newspapers; (3) agricultural and dairy papers that have considerable circulation in this state; (4) eastern and western metropolitan daily newspapers publishing college news departments; (5) news unions and bureaus furnishing news service to daily and weekly newspapers in the form of "patent insides", news letters, etc. Different forms of the bulletin are generally sent to each of these classes, in order to supply each with the news in the form best suited to its purposes. To 41 Wisconsin daily newspapers bulletins of about 1,000 words, generally containing four news articles, are sent once or twice a week. To 239 Wisconsin weekly newspapers and 36 agricultural weekly and monthly periodicals a special agricultural press bulletin of about 1,500 words is sent every week throughout the year. The New York, Boston, Philadelphia, Baltimore, Springfield, Mass., and Chicago newspapers which have a regular college news department are furnished with a press bulletin weekly containing about 750 words. Several educational magazines, six news unions and news bureaus, and the university publications, are supplied with those copies of the above mentioned bulletins best suited to their needs.

Special illustrated articles on various phases of university work are published frequently in the magazine sections of Wisconsin newspapers. Illustrations, descriptive matter, and information concerning the university are furnished upon request to magazines and magazine writers.

RESULTS.

The daily and weekly newspapers, the agricultural and dairy papers, the eastern and western metropolitan daily newspapers with college news departments, and the news unions, all publish much of the news matter furnished to them in the press bulletins. In every county in the state, with the exception of two sparsely settled, at least one weekly newspaper is printing the news furnished in the press bulletins, and in many counties from 5 to 10 weekly newspapers are publishing this news. Daily newspapers in 28 cities of the state are publishing university news taken from the bulletin. The 36 agricultural periodicals make frequent use of the material furnished in the bulletin. One newspaper in New York, one in Boston, one in Springfield, Mass., one in Philadelphia, and three in Chicago publish each week in their college news departments, the news furnished in the special press bulletin prepared for their use. Five newspaper unions, two in Chicago, one in Milwaukee, and one in

Madison, send out the press bulletin news in the "patent insides" and the stereotyped plate matter which they furnish to weekly newspapers.

Through these various publications state-wide as well as national publicity is given to the results of research and to the work of the university generally. Furthermore, all this official information concerning the university and its work is given to the reading public in a more accurate and satisfactory form than was possible previous to the establishment of the bulletin.

NEEDS.

The work of preparing these press bulletins has been done by the editor with the aid of one editorial assistant. The editing of the bulletins, and general supervision of their printing and distribution, has been done by the editor in addition to the full amount of instructional work required of him as assistant professor of English. The preparation of the bulletins, including the typewriting, mimeographing, addressing, and mailing of 425 copies weekly, each consisting of at least three mimeograph pages, involves the handling of 1,700 sheets and envelopes each week, all of which has been done by one editorial assistant, with the aid of such student help as could be secured.

The most urgent need of the department is a regularly employed assistant to operate the mimeograph, to address envelopes, to fold and mail the bulletins, and perform other similar office work. An office boy of average ability could do this work satisfactorily and greatly faciliate the prompt issuing of the bulletins. At present much of the time of the editorial assistant which should be devoted to the collection of news and the preparation of material for publication is occupied with the mechanical details of office work for which less expensive help should be employed.

Respectfully submitted,

W. G. BLEYER,

Editor.

APPENDIX A.

The Attendance at the University of Wisconsin.

1. NUMBER OF STUDENTS DURING THE PAST TEN YEARS.

College of	98–99	99–00	00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08
Letters and Science[1]	995	1,096	1.137	1.176	1,232	1.312	1,476	1.579	1.579	1,762
Mechanics and Engineering	242	327	411	513	585	744	804	768	799	921
Agriculture	326	381	440	448	461	525	526	628	622	694
Law	214	231	268	260	226	201	183	154	165	157
Course in Pharmacy	55	51	44	35	35	38	33	32	37	32
School of Music	155	199	191	169	124	172	153	209	191	150
Summer Session	......	341	323	367	410	400	403	528	568	661
Library School[2]	24	36	40	37	44	30	59	51	71	42
Less twice enumerated	64	[3]204	[3]193	[3]191	[3]205	[3]239	[3]236	[3]300	[3]303	[3]364
Total	1,923	2,422	2.619	2.777	2.870	3.151	3.342	3.571	3.659	4.013

2. NUMBER OF THE INSTRUCTIONAL FORCE.

	98–99	99–00	00–01	01–02	02–03	03–04	04 05	05–06	06–07	07–08
Professors	52	52	55	58	59	71	69	78	80	85
Associate Professors	1	2	1	1	2	1	8	9	9	13
Assistant Professors	27	29	37	33	35	40	38	45	48	59
Instructors	28	31	37	46	58	65	96	113	119	119
Assistants	17	23	32	29	30	43	44	47	71	84
University Fellows[2] [4]	10	10	14	13	13	13	13	14	18	16
Total	135	147	176	180	197	233	255	292	327	360

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[1] This includes the course in commerce. This course is so interwoven with the other courses of the college of letters and science that it cannot well be separated.

[2] Not included in totals.

[3] This large number is due to the fact that many persons who were present at the summer session were also present in the regular sessions of the university.

[4] The university fellows, though primarily students, are classified here for the reason that according to the terms of their appointment, they are required to render a small amount of instruction. This requirement, however, applies only to the university fellows; consequently the above enumeration does not include the fellows provided for by private generosity.

APPENDIX B.

Changes in the Faculty.

During the fiscal year July 1, 1906—June 30, 1907.

APPOINTMENTS.

Professors.

Name	Title.
BRADLEY, HAROLD CORNELIUS, Ph. D.,	Assistant professor of physiological chemistry.
COOK, WALTER WHEELER, A. M., LL. M.,	Professor of law.
DENNIS, ALFRED LEWIS PINNEO, Ph. D.,	Professor of European history.
ERLANGER, JOSEPH, B. S., M. D.,	Professor of physiology.
HART, EDWIN BRET, B. S.,	Professor of agricultural chemistry. Chemist of the experiment station.
HUTCHINS, CHARLES PELTON, M. D.,	Professor of physical training.
HUTCHINS, FRANK AVERY,	Field organizer, university extension.
LEGLER, HENRY E.	Secretary university extension.
LIGHTY, WILLIAM HENRY, Ph. B.,	Secretary correspondence department university extension.
PENCE, WILLIAM DAVID, C. E.,	Professor of railway engineering.
ROSS, EDWARD ALSWORTH, Ph. D.,	Professor of sociology.
STEEN, JAMES CLARENCE.	Superintendent of machine shops.
STODDART, CHARLES WILLIAM, A. M.,	Assistant professor of soils.
VAN VLECK, EDWARD BURR, Ph. D.,	Professor of mathematics.
WOODWARD, CORA STRANAHAN,	Adviser of women.

Instructors and Assistants.

ATWELL, WILLIAM ENSIGN,	Student assistant in business administration.
BAKER, JOHN EARL, Ph. B.,	Assistant in public speaking.
BASHFORD, ERMA MARY, A. B.,	Instructor in public speaking.
BENNETT, BENJAMIN FRANKLIN,	Student assistant in military science and tactics.
BEWICK, THOMAS LYMAN, Ph. B.,	Assistant in physics.
BLACKMAN, JULIAN RAYMOND, A. B., M. D.,	Assistant in physiology.
BLOOMFIELD, LEONARD, A. B.,	Assistant in German.
BRAINARD, FRANK KELLOGG, B. S.,	Assistant in physics.
BRANDT, JOSEPH GRANGER, Ph. B.,	Assistant in Latin.
BRIDGMAN, BENJAMIN WILLIAM, Ph. B.,	Assistant in Physics.
BURNETT, EARLE SMEAD, B. S.,	Research assistant in mechanical engineering.

BURRER, KARL ORMAND, B. S.,	Assistant in physics.
CAMPBELL, ROBERT, B. A.,	Laboratory assistant in political economy.
CONGER, JOHN LEONARD, M. A.,	Assistant in American history.
COREY, GEORGE WATSON, E. M.,	Assistant in mineralogy.
COULTER, JOHN LEE, A. M.,	Assistant in political economy.
COUSINS, GEORGE VIPOND, B. A.,	Assistant in European history.
DOUGHTY, HOWARD WATERS, Ph. D.,	Assistant in pharmacy.
DUVAL, EDMUND PENDLETON RANDOLPH, A. M.,	Instructor in mathematics.
ELSTON, THOMAS SIDNEY, Ph. D.,	Instructor in physics.
FOSTER, DEAN EDWARD, B. S.,	Instructor in mechanical drawing and descriptive geometry.
FUSSELL, LEWIS, M. S.,	Assistant in electrical engineering.
GAGE, FLORENCE META, M. S.,	Assistant in pharmacy and plant chemistry.
HALL, CHARLES HAROLD,	Assistant in public speaking.
HARRIS, ROY THEODORE,	Official tester in agricultural chemistry.
HARZA, LeROY FRANCIS,	Instructor in hydraulic engineering.
HICKS, FRED COLE, Ph. D.,	Instructor in German.
HILL, CHARLES WARREN, A. B.,	Assistant in chemistry.
HITCHCOCK, RAYMOND ROYCE,	Student assistant in mathematics.
HOFFMAN, CONRAD, B. S. A.,	Assistant in agricultural bacteriology.
HOPSON, HOWARD COLWELL,	Student assistant in military science and tactics.
ILES, IVORY VICTOR, A. M.,	Assistant in European history.
JENNER, EDWIN ALEXANDER, B. S.,	Assistant in psychology.
JOHNSON, ALBERT AARON,	Student assistant in military science and tactics.
JOHNSON, ARDEN RICHARD, B. S.,	Assistant in organic chemistry.
KNIGHT, HENRY SEYMOUR, A. B.,	Instructor in Hebrew and Hellenistic Greek.
KOWALKE, OTTO LOUIS, B. S.,	Assistant in chemical engineering.
LAWRENCE, FRANCIS WOLCOTT, B. S.,	Assistant in hydraulic engineering.
LEE, DAVID RUSSELL, A. M.,	Assistant in Latin.
LEONARD, WILLIAM ELLERY, Ph. D.,	Instructor in English.
LOEB, MAX, B. A.,	General secretary of the Alumni association.
LOEW, EDGAR ALLEN, B. S.,	Instructor in electrical engineering.
MACDUFF, DOUGLAS, A. B.,	Assistant in romance languages.
MARCH, HERMAN WILLIAM, M. A.,	Instructor in mathematics.
MARSHALL, ROY R.,	Student assistant in soils.
MARTIN, LAWRENCE, A. M.,	Assistant in geology.
McDANIEL, ALONZO SIMPSON, M. A.,	Instructor in chemistry.
McLEOD, ANDREW FRIDLEY, Ph. D.,	Instructor in soils.
MEAD, WARREN JUDSON, B. S.,	Assistant in geology.
MICHELL, ROBERT BELL, A. M.,	Instructor in romance languages.
MILWARD, JAMES GARFIELD,	Assistant in horticulture.
MOODY, SETH ENOCH, Ph. D.,	Instructor in analytical chemistry.
NORTHROP, GEORGE NORTON, B. A.,	Instructor in English.
OSWALD, FREDERICK WILLIAM, Jr., A. M.,	Assistant in German.
OWEN, HERMAN EVERETT,	Instructor in music.
PAETOW, LOUIS JOHN, Ph. D.,	Instructor in history.
PERRIN, FORTUNE RICHARD, B. L. S.,	Assistant in French.
PRICE, JOHN REESE, B. S.,	Instructor in electrical engineering.

PRICE, WILLIAM HYDE, Ph. D.,	Instructor in political economy.
ROGERS, AUGUSTUS JAMES, Jr.,	Student assistant in soils.
ROLOFF, WALTER EDWARD, A. M.,	Assistant in German.
RUGGLES, ALLEN MEAD, A. B.,	Assistant in physics.
RUSSELL, HARRY UNION, B. S.,	Assistant in political science.
SANFORD, HERBERT BROOKS,	Student assistant in electrical engineering.
SCHAFFNER, MARGARET ANNA, Ph. D.,	Assistant in political science.
SCHROEDER, CHRISTIAN, B. S. A.,	Assistant in animal husbandry.
SCHULZ, RAYMOND LOUIS,	Student assistant in animal husbandry.
SCOTT, JONATHAN FRENCH, M. A.,	Assistant in education.
SCOTT, ROBERT BRUCE, Ph. B.,	Instructor in political science.
STEPHENS, GEORGE WARE, Ph. B.,	Assistant in political economy.
SUYDAM, VERNON ANDREW, B. S.,	Assistant in physics.
TEN EYCK, EDWARD HANLAN,	Instructor in physical training.
TOTTINGHAM, WILLIAM EDWARD, B. S.,	Instructor in agricultural chemistry.
UNDERWOOD, WALTER SCOTT,	Student assistant in military science and tactics.
VAN ZANDT, JEROME GOODSPEED, B. S.,	Assistant in railway engineering.
WATTS, OLIVER PATTERSON, Ph. D.,	Instructor in applied electrochemistry.
WAYSON, NEWTON EDWARD, A. B.,	Assistant in bacteriology.
WEBER, AUGUST WILLIAM, Ph. M.,	Assistant in education.
WILD, EDMUND, M. S.,	Assistant in German.
WOODS, HERBERT SPENCER, M. A.,	Instructor in chemistry.

RANSOM, LYLA ALBINA,	Assistant in public school music.
KATELEY, FRED,	Assistant in forge practice.
DELWICHE, EDMUND JOSEPH, B. S. A.,	Superintendent Superior demonstration farms.

PROMOTIONS.

Professors.

ADAMS, THOMAS SEWALL, Ph. D.,	From assistant professor to associate professor of political economy.
ANGELL, EMMETT DUNN,	From instructor to assistant professor of physical training.
BLACKWELDER, ELIOT, A. B.,	From instructor to assistant professor of geology.
BODE, BOYD HENRY, Ph. D.,	From instructor to assistant professor of philosophy.
HUMPHREY, GEORGE COLVIN, B. S.,	From assistant professor to professor of animal husbandry.

Instructors and Assistants.

COOL, CHARLES DEAN, A. M.,	From assistant to instructor of romance languages.
FULLER, CALEB ALLEN, Ph. D.,	From assistant in hygienic laboratory to instructor in bacteriology and assistant in hygienic laboratory.
HAERTEL, MARTIN HENRY, Ph. D.,	From assistant to instructor in German.
JONES, EDWARD RICHARD, B. S. A.,	From assistant to instructor in soils and drainage.
MARQUETTE, WILLIAM GEORGE, B. S.,	From assistant to instructor in botany.
WICKENDEN, WILLIAM ELGIN, B. S.,	From assistant in physics to instructor in electrical engineering.

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Changes in Title.

BURCHELL, DURWARD EARLE, A. M.,	From professor of business adminstration to auditor and professor of business administration.
ELSOM, JAMES CLAUDE, M. D.,	From professor of physical training and director of the gymnasium, to professor of physical training.
KREMERS, EDWARD, Ph. G.,	From professor of pharmaceutical chemistry to director of the course in pharmacy and professor of pharmaceutical chemistry.
LAIRD, ARTHUR GORDON, Ph. D.,	From assistant professor of ancient languages to assistant professor of Greek and comparative philology.
SELLERY, GEORGE CLARK, Ph. D.,	From assistant professor of history to director of the summer session and assistant professor of history.

Changes in the Faculty.

During the fiscal year of July 1, 1907—June 30, 1908.

APPOINTMENTS.

Professors.

Name.	Title.
BASSETT, HARRY KENDALL, B. S.,	Lecturer in education.
COLE, ROSSETTER GLEASON, Ph. B.,	Director of the school of music.
CUNLIFFE, JOHN WILLIAM, D. Lit.,	Professor of English.
ENSIGN, ORVILLE HIRAM,	Professor of electrical engineering.
GAGE, OTIS AMSDEN, Ph. B.,	Assistant professor of physics.
HAWES, CHARLES HENRY, M. A.,	Lecturer in anthropology.
McCOY, RALPH,	Captain U. S. Army, professor of military science and tactics.
RAVENEL, MAZYCK PORCHER, M. D.,	Professor of bacteriology.
REBER, LOUIS EHRHART, M. S.,	Director of university extension.
REED, FRANK OTIS, Ph. D.,	Assistant professor of romance languages.
SAMMIS, JOHN LANGLEY, Ph. D.,	Assistant professor of dairy husbandry.
WALTON, JAMES HENRI, Jr., Ph. D.,	Assistant professor of chemistry.
WINCHELL, ALEXANDER NEWTON, D. Sc.,	Assistant professor of geology.

Instructors and Assistants.

ALDRICH, LOYAL BLAINE, B. A.,	Assistant in physics.
AMBLER, CHARLES HENRY, M. A.,	Assistant in American history.
ANDREWS, JOHN BERTRAM, M. A.,	Assistant in political economy.
ARZBERGER, EMIL GODFRED, Ph. B.,	Assistant in botany.
ASHMUN, MARGARET ELIZA, Ph. B.,	Assistant in English.
ATKINSON, ELIZÁBETH ELLIOTT,	Assistant in physical training.
AYERS, AUGUSTINE HAINES, C. E.,	Instructor in hydraulic engineering.
BAILEY, WILLIAM LOUIS, M. A.,	Assistant in political science.
BARTHOLOMEW, BRUCE, Ph. M.,	Assistant in mathematics.

BIRKETT, MILES WREN,	Student assistant in military science and tactics.
BIRKHOFF, GEORGE DAVID, Ph. D.,	Instructor in mathematics.
BOWLES, JAMES TENBROECK, B. S.,	Sanitary chemist hygienic laboratory.
BRANNON, JAMES MARSHALL, B. A.,	Assistant in botany.
BRESLICH, ARTHUR LOUIS, Ph. D.,	Instructor in Hellenistic Greek.
BREWER, ROBERT KEMP, A. B.,	Assistant in chemistry.
BRUNS, FRIEDRICH, M. A.,	Instructor in German.
CHASE, WAYLAND JOHNSON, A. M.,	Assistant in history.
COLBURN, GUY BLANDIN, A. M.,	Assistant in Latin.
DEHIL, JOSEPH DWIGHT, A. B.,	Assistant in German.
DUDGEON, MATTHEW SIMPSON, A. B., LL. B.,	Instructor in political science.
DUNCALF, FRED, A. B.,	Assistant in european history.
DYE, DANIEL SHEETS, B. S.,	Assistant in physics.
EGELHOFF, ROBERT FRED, B. S.,	Instructor in mechanical drawing.
FLAMMER, ERNEST, B. S.,	Instructor in electrical engineering.
FORD, AMELIA CLEWLY, A. M.,	Assistant in American history.
FORSYTHE, WILLIAM ELMER, B. S.,	Assistant in physics.
GAARDEN, OSCAR H., B. S.,	Assistant in physics.
GATES, CHARLES BALDWIN, Ph. M.,	Assistant in chemistry.
GREY, ERNEST GEORGE, A. B.,	Assistant in anatomy.
GRIFFIN, JAMES SHELDON, A. B.,	Assistant in romance languages.
HAMMER, MILBY ROY, B. S.,	Instructor in mechanical drawing.
HEGNER, ROBERT WILHELM, S. M.,	Assistant in zoology.
HEIL, HERMAN GUSTAVUS, Ph. B.,	Instructor in physics.
HEINZ, ADOLPH,	Student assistant in military science and tactics.
HELMHOLTZ, ANNA AUGUSTA, M. A.,	Assistant in English.
HERRICK, LOUIS ROWELL, B. S.,	Instructor in French.
HICKMAN, MARY AVIS, M. A.,	Assistant in botany.
HINE, GEORGE SHERWOOD, B. S. A.,	Assistant in feed and fertilization inspection.
JAHNS, MARIE LOUISE, B. A.,	Instructor in soils.
JOHNSTONE, ALBERT HENRY, B. A.,	Intructor in public speaking.
JOLIVETTE, HALLY DELILIA MARY, B. A.,	Herbarium assistant.
KEITH, OSCAR LOVELL, A. M.,	Instructor in romance languages.
KENNEY, JAMES FRANCIS, B. A.,	Assistant in european history.
KENYON, ELIZABETH WATSON, M. A.,	Assistant in political science.
KNIGHT, CHARLES S., B. S. A.,	Assistant in feed and fertilization inspection.
KOMMERS, JESSE BENJAMIN, B. S.,	Instructor in mechanics.
LAMOTT, FRANK ALEXANDER, M. S.,	Assistant in romance languages.
LEFEBVRE, CLARENCE CHARLES, B. A.,	Assistant in pharmacy.
LEHMANN, VAN VECHTEN,	Student assistant in bacteriology.
LEWIS, CHARLES EDWARD, Ph. D.,	Instructor in botany.
MACKENZIE, FREDERICK WILLIAM, B. A.,	University editor.
McBRIDE, BERNARD REEVES, B. S.,	Instructor in hydraulic engineering.
McCOLLUM, ELMER VERNER, Ph. D.,	Instructor in agricultural chemistry.
McFADDEN, MARY ISABEL, Ph. B.,	Assistant in education.
MERCEIN, CHARLES SCHLEY,	Student assistant in military science and tactics.
MERRICK, JESSIE BEE, B. S.,	Assistant in physical training.
MICHELS, MATTHIAS,	Assistant in dairy husbandry.
MILLER, ARTHUR HERBERT, B. S.,	Instructor in mechanics.
MORGAN, BAYARD QUINCY, Ph. D.,	Instructor in German.

MOTT, WILLIAM ROY, B. S.,	Instructor in chemistry.
NELSON, OLIVER OTTO, B. A.,	Assistant in bacteriology.
NEWELL, JANE ISABEL, A. B.,	Assistant in American history.
PARKER, EUSTACE EDWIN, B. S.,	Assistant in structural engineering.
PENN, WILLIAM CLAY, B. S.,	Instructor in topographical engineering.
PLAGGE, HERBERT JOHN, B. S.,	Assistant in physics.
ROEBUCK, JOHN RANSOM, Ph. D.,	Instructor in physics.
SCHOLZ, RICHARD FREDERICK, M. A.,	Instructor in european history.
SHANNAHAN, WILLARD DEAN, A. B.,	Assistant in Latin.
SHEPHARD, WALTER JAMES, A. B.,	Instructor in political science.
SMITH, ALPHEUS WILSON, Ph. D.,	Instructor in physics.
SMITH, KARL WALLER,	Instructor in bacteriology.
STEIDTMANN, EDWARD, M. A.,	Assistant in mineralogy.
STEVE, WILLIAM FREDERICK, Ph. D.,	Assistant in physics.
SUTHERLAND, ARTHUR HOWARD, A. B.,	Assistant in philosophy.
SUZUKI, SHINKICHI NOGAKUSHI,	Research assistant in agricultural bacteriology.
VON TEUBERN, ERNST FREIHERR,	Assistant in political science.
TITSWORTH, WALDO ALBERTI, A. M.,	Assistant in physics.
TITUS, MARTIN EDWIN, Ph. G.,	Student assistant in pharmacy.
UNDERHILL, ANTHONY LISPENARD, Ph. D.,	Instructor in mathematics.
WARNER, FRANK MELVILLE,	Instructor in mechanical drawing.
WEID, JOHN CLIFFORD, B. S.,	Instructor in experimental engineering.
WILCOX, WENDELL GARRETT, Ph. M.,	Assistant in chemistry.
WILLIAMS, FRANK ERNEST,	Student assistant in geology.
WOLESENSKY, EDWARD, A. M.,	Assistant in chemistry.
ZDANOWICZ, CASIMIR DOUGLASS, Ph. D.,	Instructor in romance languages.

PROMOTIONS.

RUSSELL, HARRY LUMAN, Ph. D.,	From professor of bacteriology to dean of the college of agriculture and director of the agricultural experiment station.
ALLEN, CHARLES ELMER, Ph. D.,	From assistant professor to associate professor of botany.
BARDEEN, CHARLES RUSSELL, A. B., M. D.,	From professor of anatomy to dean of the college of medicine and professor of anatomy.
BEATTY, ARTHUR, Ph. D.,	From instructor to assistant professor of English.
DAVIS, GEORGE JACOB, Jr., C. E.,	From instructor to assistant professor of hydraulic engineering.
DEARBORN, WALTER FENNO, Ph. D.,	From instructor to assistant professor of education.
DENNISTON, ROLLIN HENRY, Ph. D.,	From instructor to assistant professor of botany.
DICKINSON, THOMAS HERBERT, Ph. D.,	From instructor to assistant professor of English.
ELLIOTT, EDWARD CHARLES, Ph. D.,	From associate professor to professor of education.
FISH, CARL RUSSELL, Ph. D.,	From assistant professor to associate professor of American history.

FROST, WILLIAM DODGE, Ph. D.,	From assistant professor to associate professor of bacteriology.
GILMAN, STEPHEN WARREN, LL. B.,	From instructor to assistant professor of business administration.
GOODNIGHT, SCOTT HOLLAND, Ph. D.,	From instructor to assistant professor of German.
LAIRD, ARTHUR GORDON, Ph. D.,	From assistant professor to associate professor of Greek and comparative philology.
LENHER, VICTOR, Ph. D.,	From associate professor to professor of chemistry.
LORENZ, MAX OTTO, Ph. D.,	From instructor to assistant professor of political economy.
MOORE, JAMES GARFIELD, M. S.,	From instructor to assistant professor of horticulture.
OCOCK, CHARLES ALBERT, B. S.,	From instructor to assistant professor of agricultural engineering.
OTIS, DANIEL HENRY, M. S.,	From assistant to dean of college of agriculture and assistant professor of animal nutrition, to assistant to dean of college of agriculture and associate professor of animal nutrition.
OVERTON, JAMES BERTRAM, Ph. D.,	From instructor to assistant professor of botany.
PHILLIPS, ULLRICH BONNELL, Ph. D.,	From instructor to assistant professor of American history.
SCOTT, ROBERT BRUCE, Ph. B.,	From instructor to assistant professor of political science.
TAYLOR, HENRY CHARLES, Ph. D.,	From assistant professor to associate professor of political economy.
VOSSKUEHLER, JOSEPH HENRY, M. E.,	From instructor to assistant professor of machine design.

Instructors.

BURRER, KARL ORMAND, B. S.,	From assistant in physics to instructor in electrical engineering.
KOWALKE, OTTO LOUIS, B. S.,	From assistant to instructor in chemical engineering.
MARTIN, LAWRENCE, A. M.,	From assistant to instructor in geology.
MILWARD, JAMES GARFIELD,	From assistant to instructor in horticulture.
ROGERS, AUGUSTUS JAMES, Jr., B. S.,	From student assistant to assistant in horticulture.
SANFORD, HERBERT BROOKS, B. S.,	From student assistant to instructor in electrical engineering.
SCHAFFNER, MARGARET ANNA, Ph. D.,	From assistant to instructor in political science.

Changes in Title.

PARKINSON, JOHN BARBER, A. M.,	Vice president, from professor to emeritus professor of contitutional and international law.
BARTLETT, JAMES L., B. S.,	Observer, U. S., weather bureau, to observer U. S. weather bureau and assistant professor of meteorology.
BURCHELL, DURWARD EARLE, A. M.,	From auditor and professor to professor of business administration.

DANIELLS, WILLIAM WILLARD, M. S., Sc. D.,	From professor to emeritus professor of chemistry.
HENRY, WILLIAM ARNON, D. Agr., D. Sc.,	From dean of the college of agriculture, director of the agricultural experiment station, and professor of agriculture to emeritus professor of agriculture.
KERR, ALEXANDER, A. M.,	From professor to emeritus professor of the Greek language and literature.
PARKER, FLETCHER ANDREW,	From director of the school of music and professor of music to emeritus professor of music.

VACANCIES.

Taking effect June 30, 1907, unless otherwise indicated.

CURTIS, CHARLES ALBERT, A. B. .... Died
Captain U. S. Army, Professor of military science and tactics.
FENNEMAN, NEVIN MELANCTHON, Ph. D. .... Resigned
Professor of geology.
HORACK, HUGO CLAUDE, Ph. B., LL. B. .... Resigned
Assistant professor of law.
JACKSON, DUGALD CALEB, C. E. .... Resigned
Professor of electrical engineering.
KING, CHARLES ISAAC .... Dropped
Professor of mechanical practice.
LEGLER, HENRY E. .... Term expired
Secretary University extension.
MOORE, HERBERT FISHER, M. M. E. .... Resigned
Assistant professor of mechanics.

Instructors and Assistants.

ATWELL, WILLIAM ENSIGN .... Term expired
Student assistant in business administration.
BAKER, JOHN EARL, Ph. B. .... Resigned
Assistant in public speaking.
BASS, ELIZABETH, A. B. .... Resigned
Instructor in physical training.
BENNETT, BENJAMIN FRANKLIN .... Resigned
Student assistant in military science and tactics.
BEWICK, THOMAS LYMAN, Ph. B. .... Term expired
Assistant in physics.
BOARDMAN, ELIOT, A. B. .... Term expired
Assistant in French.
CLAWSON, ARTHUR BROOKS, B. A. .... Term expired
Assistant in zoology.
COLTON, ALLEN LYSANDER, A. M. .... Term expired
Instructor in physics.
CONGER, JOHN LEONARD, M. A. .... Term expired
Assistant in American history.
COREY, GEORGE WATSON, E. M. .... Resigned
Assistant in mineralogy.
COUSINS, GEORGE VIPOND, B. A. .... Term expired
Assistant in european history.
CRAWFORD, DAVID ANDERSON, B. A. .... Resigned
Assistant in anatomy.
DOUGHTY, HOWARD WATERS, Ph. D. .... Term expired
Instructor in chemistry.

ELLIOTT, HOWARD STICKNEY, B. S. .... Term expired
Instructor in electrical engineering.

ELSTON, THOMAS SIDNEY, Ph. D. .... Term expired
Instructor in physics.

FOSTER, DEAN EDWARD, B. S. .... Term expired
Instructor in mechanical drawing and descriptive geometry.

FUSSELL, LEWIS, M. S. .... Term expired
Assistant in electrical engineering.

GAGE, FLORENCE META, M. S. .... Term expired
Assistant in pharmacy and plant chemistry.

HALL, CHARLES HAROLD .... Term expired
Assistant in public speaking.

HARZA, LeROY FRANCIS, B. S. .... Resigned
Instructor in hydraulic engineering.

HITCHCOCK, RAYMOND ROYCE .... Term expired
Student assistant in mathematics.

HOPSON, HOWARD COLWELL .... Term expired
Student assistant in military science and tactics.

HOTCHKISS, WILLIAM OTIS .... Resigned
Instructor in petrology.

ILES, IVORY VICTOR, A. M. .... Term expired
Assistant in european history.

JENNER, EDWIN ALEXANDER, B. S. .... Term expired
Assistant in psychology.

JOHNSON, ALBERT AARON .... Term expired
Student assistant in military science and tactics.

KNIGHT, HENRY SEYMOUR, A. B. .... Resigned
Instructor in Hebrew and Hellenistic Greek.

LAWRENCE, FRANCIS WOLCOTT, B. S. .... Resigned
Assistant in hydraulic engineering.

LEE, DAVID RUSSELL, A. M. .... Term expired
Assistant in Latin.

LOEB, MAX, B. A. .... Resigned
General secretary of the Alumni association.

LUTMAN, BENJAMIN FRANKLIN, A. B. .... Term expired
Assistant in botany.

MACDUFF, DOUGLAS, A. B. .... Term expired
Assistant in romance languages.

MARSHALL, ROY R. .... Term expired
Student assistant in soils.

McLEOD, ANDREW FRIDLEY, Ph. D. .... Term expired
Instructor in soils.

MILLER, LOUALLEN FREDERICK, A. M. .... Term expired
Instructor in physics.

MOLES, EDWARD SNETTING, B. S. .... Term expired
Instructor in mechanical drawing.

MORITZ, ERNEST ANTHONY, C. E. .... Resigned
Instructor in mathematics.

NELLES, WALTER RALSTON, A. B. .... Term expired
Instructor in English.

NORTH, HARRY BRIGGS, M. A. .... Term expired
Instructor in chemistry.

OLIVE, EDGAR WILLIAM, Ph. D. .... Term expired
Instructor in botany.

PAETOW, LOUIS JOHN, Ph. D. .... Term expired
Instructor in history.

PATZER, OTTO, M. L. .... Term expired
Instructor in French.

PERRIN, FORTUNÉ RICHARD, B. L. S. .... Term expired
Assistant in French.

POTTER, JOHN CHURCH, B. S. .... Term expired
Instructor in electrical engineering.

PURIN, CHARLES MALTADOR .... Resigned
Student assistant in German.

REED, GEORGE MATTHEW, A. M. .... Resigned
Assistant in botany.

RUGGLES, ALLEN MEAD, A. B. .... Term expired
Assistant in physics.

RUSSELL, HARRY UNION, B. S. .... Term expired
Assistant in political science.

SCHROEDER, CHRISTIAN, B. S. A. .... Term expired
Assistant in animal husbandry.

SIEVERS, ARTHUR FREDERICK, Ph. G. .... Term expired
Assistant in pharmaceutical chemistry.

STEPHENS, GEORGE WARE, Ph. B. .... Term expired
Assistant in political economy.

SUYDAM, VERNON ANDREW, B. S. .... Term expired
Assistant in physics.

UNDERWOOD, WALTER SCOTT .... Term expired
Student assistant in military science and tactics.

WAYSON, NEWTON EDWARD, A. B. .... Resigned
Assistant in bacteriology.

WETZEL, REINHARD AUGUST, B. S. .... Term expired
Assistant in physics.

WILLIAMS, ELMER HOWARD, M. A. .... Term expired
Assistant in physics.

WOODS, HERBERT SPENCER, M. A. .... Term expired
Instructor in chemistry.

SMITH, GENEVIEVE CHURCH .... Resigned
Instructor in music.

ANDERSON, BERTIE SAMUEL .... Resigned
Machinist and assistant in shop practice.

KRATSCH, HENRY .... Term expired
Assistant in forge practice.

MARX, WILLIAM GEORGE .... Term expired
Assistant in forge practice.

McINTOSH, WALTER HARLAND .... Term expired
Instructor in wood mechanics.

VACANCIES.

Taking effect June 30, 1908, unless otherwise indicated.

ANGELL, EMMET DUNN .... Resigned
Assistant professor of physical training.

BASHFORD, ROBERT McKEE, A. M., LL. B. .... Resigned
Professor of law.

BULL, STORM .... November 17, 1907, died
Professor of steam engineering.

BURCHELL, DURWARD EARLE, A. M. .... Resigned
Professor of business administration.

ENSIGN, ORVILLE HIRAM .... Resigned
Professor of electrical engineering.

HUNT, CAROLINE LOUISA, A. B. .... Resigned
Professor of home economics.

MEYER, JESSIE MARTHA, B. S. .... Resigned
Mistress of Chadbourne Hall.

PHILLIPS, ULLRICH BONNELL, Ph. D. .... Resigned
Assistant professor of American history.

SPARLING, SAMUEL EDWIN, Ph. D. .... Term expired
Assistant professor of political science.

Instructors and Assistants.

AMBLER, CHARLES HENRY, M. A .... Term expired
Assistant in American history.
ANDREWS, JOHN BERTRAM, M. A .... Term expired
Assistant in political economy.
ATWOOD, JAMES THOMAS, B. S .... Term expired
Instructor in experimental engineering.
AYERS, AUGUSTINE HAINES, C. E .... Resigned
Instructor in hydraulic engineering
BARTHOLOMEW, BRUCE, Ph. M .... Term expired
Assistant in mathematics.
BASHFORD, ERMA MARY, A. B .... Term expired
Instructor in public speaking.
BIRKETT, MILES WREN .... Term expired
Student assistant in military science and tactics.
BLACKMAN, JULIAN RAYMOND, A. B., M. D .... Resigned
Assistant in physiology.
BLOOMFIELD, LEONARD, A. B .... Term expired
Assistant in German.
BRESLICH, ARTHUR LOUIS, Ph. D .... Resigned
Instructor in Hellenistic Greek.
COULTER, JOHN LEE, A. M .... Resigned
Assistant in political economy.
DEIHL, JOSEPH DWIGHT, A. B .... Term expired
Assistant in German.
DILWORTH, JAMES FRANCIS, A. M .... Term expired
Assistant in european history.
DUVAL, EDMUND PENDLETON RANDOLPH, A. M .... Resigned
Instructor in mathematics.
DYE, DANIEL SHEETS, B. S .... Term expired
Assistant in physics.
FLAMMER, ERNEST, B. S .... Term expired
Instructor in electrical engineering.
FORD, AMELIA CLEWLY, A. M .... Term expired
Assistant in American history.
GREY, ERNEST GEORGE, A. B .... Term expired
Assistant in anatomy.
GRIFFIN, JAMES SHELDON, A. B .... Resigned
Assistant in romance languages.
HEGNER, ROBERT WILLIAM, S. M .... Term expired
Assistant in zoology.
HEINZ, ADOLPH .... Term expired
Student assistant in military science and tactics.
HELMHOLTZ, ANNA AUGUSTA, M. A .... Term expired
Assistant in English.
HICKS, FRED COLE, Ph. D .... Term expired
Instructor in German.
JOHNSON, ARDEN RICHARD, B. S .... Term expired
Assistant in organic chemistry.
KEITH, OSCAR LOVELL, A. M .... Resigned
Instructor in romance languages.
KELLY, FREDERICK THOMAS, Ph. D .... Resigned
Instructor in Hebrew and Hellenistic Greek.
KENNEY, JAMES FRANCIS, B. A .... Term expired
Assistant in european history.
KENYON, ELIZABETH WATSON, M. A .... Term expired
Assistant in political science.
KNIGHT, CHARLES S., B. S. A .... Resigned
Assistant in feed and fertilization inspection.

LaMOTT, FRANK ALEXANDER, M. S.......Resigned
Assistant in romance languages.
LeFEBVRE, CLARENCE CHARLES, B. A.......Term expired
Assistant in pharmacy.
LEHMANN, VAN VECHTEN.......Term expired
Student assistant in bacteriology.
LEWIS, CHARLES EDWARD, Ph. D.......Resigned
Instructor in botany.
McFADDEN, MARY ISABEL, Ph. B.......Term expired
Assistant in education.
MERCEIN, CHARLES SCHLEY.......Term expired
Student assistant in military science and tactics.
MOODY, SETH ENOCH, Ph. D.......Resigned
Instructor in analytical chemistry.
NELSON, OLIVER OTTO, B. A.......Term expired
Assistant in bacteriology.
NEWELL, JANE ISABEL, A. B.......Term expired
Assistant in American history.
NORTHROP, GEORGE NORTON, M. A.......Resigned
Instructor in English.
OLSON, GEORGE ALFRED, B. S. A.......Term expired
Instructor in agricultural chemistry. Assistant chemist experiment station.
OWEN, HERMAN EVERETT.......Term expired
Instructor in music.
PATTERSON, DAVID LESLIE, B. S.......Resigned
Instructor in history.
PENN, WILLIAM CLAY, B. S.......Term expired
Instructor in topographical engineering.
PYNCH, JENNER ALFRED.......Term expired
Student assistant in geology.
SCHAFFNER, MARGARET ANNA, Ph. D.......Resigned
Instructor in political science.
SCHOLZ, RICHARD FREDERICK, M. A.......Resigned
Instructor in european history.
SHANKS, LEWIS PIAGET, A. M.......Resigned
Instructor in romance languages.
SHINN, FREDERICK LaFAYETTE, Ph. D.......Resigned
Instructor in physical chemistry.
SMITH, KARL WALLER.......Term expired
Instructor in bacteriology.
SUTHERLAND, ARTHUR HOWARD, A. B.......Term expired
Assistant in philosophy.
SUZUKI, SHINKICHI NOGAKUSHI.......Term expired
Research assistant in agricultural bacteriology.
von TEUBERN, ERNEST FREIHERR.......Term expired
Assistant in political science.
TIBBALS, CHARLES AUSTIN, Jr., A. M.......Resigned
Instructor in chemistry and assaying.
VORHEIS, CHARLES TAYLOR, B. S.......Term expired
Assistant in zoology.
WARNER, FRANK MELVILLE, B. S.......Term expired
Instructor in mechanical drawing.
WILD, EDMUND, M. S.......Term expired
Assistant in German.
WILLIAMS, LESTER DENNISON, B. S.......Resigned
Instructor in civil engineering.
WOLESENSKY, EDWARD, A. M.......Term expired
Assistant in chemistry.

REPORT OF THE BOARD OF VISITORS

1907-8

Madison, Wis., May 19, 1908.

To the Board of Regents, of the University of Wisconsin:

Having approved the reports of the sub-committees, the board of visitors of the university has requested me to submit these reports to you, in accordance with your request at the time of our appointment.

Respectfully,

T. E. BRITTINGHAM,
Chairman.

ANCIENT AND MODERN LANGUAGES.

Your committee on ancient and modern languages begs leave to submit the following report:

The committee as a whole visited various departments of ancient and modern languages, and subsequently each member visited classes a number of times.

The committee found the teaching in the department of ancient languages very satisfactory. The spirit of the class room was excellent, students showed a keen interest in their work, which was due in a large measure to the fact that the teachers were alive to their work and conducted recitations in a thorough and definite manner.

In the advance classes of the German department and the department of Romance languages, the committee was impressed with the efficiency of the instruction and a stimulating class spirit.

The quality of work done by the secondary faculty in these departments did not impress the committee very favorably. True, we found some good individual work among some instructors and professors especially in the German department, but in many classes there was a noticeable lack of vigor and inspiration. There was much evidence pointing toward organization and unification, but it appeared to be almost wholly on subject matter and numerical distribution. The pedagogical problems which arise on account of the large increase in the number of sections in elementary classes, and a corresponding increase in the number of instructors and assistants, has received very little attention. There appear to be sufficient class rooms and the classes on the whole are sufficiently small in number to warrant thorough and efficient class room work. A number of instructors appeared to possess good knowledge of subject matter, but exercised little or no pedagogical skill in teaching. Upon inquiry we learned that departmental conferences are held with instructors from time to time, but the pedagogical aspect of problems receives but minor consideration.

There is but one solution—to a thorough organization and unification must be added frequent supervision of actual class room work by a professor who can give life, vigor and inspiration to an already large corps of instructors.

Your committee believes one of the most important and serious problems is the organization, effective supervision, and correlation of the work of the secondary faculty of a rapid growing institution like our own university.

Respectfully submitted,
F. A. HAGEMANN,
H. S. YONKER,
H. C. BUELL.

COLLEGE OF LAW.

Your committee on the college of law submits the following report:—

We are of the opinion that the college of law is in good condition and improving steadily in the quality of its work, as well as gaining in influence and reputation in our own and in neighboring states.

The raising of the standard of requirements for admission has been considered unwise by many friends of the school, but we believe time will justify this action. At present, however, and perhaps permanently, we think special emphasis and publicity should be given to the rule which provides for the admission of students of mature age and special fitness and aptness for the work; the admission of such students, and their graduation in proper cases, would prevent the falling off in attendance at the school and ought not to impair its efficiency.

The summer school established last summer, met with flattering success and seems certain to develop into an institution of great usefulness.

In our judgment, the weakest point in the work of the college of law is in the instruction in pleading, practice, etc. We do not believe in sacrificing the other work now carried on, nor in attempting to introduce too large an element of the practical, but think that in various branches of the work, a greater infusion of the practical would add both interest and profit.

Respectfully submitted,
J. E. MCCONNELL,
ANDREW D. AGNEW,
L. K. LUSE,
M. J. WALLRICH,
A C. PRESCOTT,
Committee.

GROUNDS AND BUILDINGS.

Your sub-committee on grounds and buildings has been unable, together, to examine and consider the important subjects committed to it, but separately, the members have acquired a familiarity with the grounds and buildings, as well as with the libraries and museums.

We regard the grounds as beautiful and the state as exceedingly fortunate in securing them at so early a date, when so little was known of them and so little interest taken in the university. And in view of the circumstances and the exceedingly small sums of money available, we think that former boards of regents have done well, in the location, selection and erection of the buildings now in existence. But a large portion of these buildings, even those erected within a few years past, are greatly overcrowded, as no human foresight could foretell the growth which the university has had, but the time has come when the university authorities must look forward to still greater expansion. We heartily approve the plan, now well formulated by the board of regents, to group the different and related colleges, under a general plan proposed by a committee of able architects, so that the general style of architecture will be symmetrical and suited to the particular use for which each building is erected, the details, however, to be worked out by the university's own architect, as the views of the regents and faculty and the circumstances may direct as the various institutions grow; each building to be a part of a general whole. The three buildings to be erected this year will be a part of this general plan and the first to be erected under it. In the completion of this general plan many of the present buildings will be removed, but your committee would seriously urge that the old north and south halls should be retained for their historical interest. These buildings, however, at some time should have extensive repairs.

We think the greatest disappointment one finds in an examination of the university buildings is with the newly constructed chemical building, which is a veritable fire trap, and which, in our opinion, should be the most thoroughly fire proof of any building of the university. It is a fine looking building, and upon consultation with the university architect, we find that its outer walls are good and strong, and that with the money and a free hand, he could make a thoroughly fire proof building of it. This should be brought about, when it is among the possibilities so to do.

Each succeeding committee points out the need for more room in the library building. This need has developed so unexpectedly and the future requirements seem now so enormous, compared with former calculations, that it is probable the room allotted, in the present plan for another wing, will be so far from sufficient, and very soon, that other buildings will have to be erected to provide for the growing needs, and we would urgently advise the separation of the university and historical libraries, and that a special building be erected at some other locality for the former, rather than to spoil the beauty of the present magnificant historical library building.

The museums are also crowded, particularly the interesting, small but growing collection in the rooms of the school of commerce. Temporary relief could be afforded if the United States Signal Service department could be removed from this building, viz., north hall. We are told the government stands ready to erect suitable quarters for this service when the university will give it title to suitable grounds therefor. We incline to the opinion that, if this is the fact, a suitable location should be selected and the title given to the United States government, from some portion of the present university possessions.

It is unfortunate that the University of Wisconsin is so absolutely dependent upon the bounty of the state for its support and up-building; but it has arrived at a point, where its wisdom, its good management, its very high standing among the universities of America, and the continual great good accomplished for the state of Wisconsin, outside of the simple education of the young men and women who go there, is coming to be so much better understood by the people of the state, that that bounty will be more and more liberal as the years go by, and in our judgment no regent should hesitate to ask for the money that is required to continue its high standard, and its necessary expansion, as fast as the financial conditions of the state will warrant.

JAS. H. ELMORE,
W. J. PEARCE,
ARABELLE S. BRANDENBURG.

Your committee on grounds and buildings desires to supplement the foregoing report with the following addition, drafted by Mrs. O. D. Brandenburg.

Your committee feels that a systematized scheme of landscape gardening should be adopted, with reference to the entire grounds and all future parking, planting, walks and drives be effected in accordance therewith. If the adoption and execution of this recommendation involves the employment of special talent, your committee beilieves the importance of making the most that is possible of the glorious reservation will amply justify any reasonable expenditure.

As a minor feature in any uniform plan of beautification, that meaningless cemetery of class markers near main hall, of course should be effaced. Seniors may leave in other forms memorials altogether more desirable and pleasing. They should, if possible, be persuaded hereafter to discontinue this disfiguring mortuary practice.

JAS. H. ELMORE,
W. J. PEARCE,
ARABELLE S. BRANDENBURG.

COLLEGE OF AGRICULTURE.

HORTICULTURE AND SOILS.

Your committee in the departments respectively of horticulture and soils of the college of agriculture, reports as follows:

The investigation made by the committee during the year, although too limited to make a detailed recommendation, was of such a character and extended over such a period of time as to satisfy your committee that many improvements are urgently needed in these departments.

Before asking for the extension or expansion of any one of the departments of the college of agriculture, we think it is proper to say that the people of the whole country, as well as the people of this state, are under great obligation to the college of agriculture of our university, and to the men who have been and are in charge of the same.

Some of the most valuable contributions to science have come from this department, and there should be no let up in extending this work consistent with the growth of the state and with the ability of the people to pay for the same. The work carried on in providing means for exterminating smuts, rusts, potato rot, and for killing noxious insects, and in improving quality and quantity in the yield of corn, oats and other cereal crops, cannot be too highly commended.

A large percentage of the people in the state are still in ignorance of the great work that is being done in these lines at the university. Means should be devised to bring this knowledge to all the farmers of the state who are anxious to conduct their farms on a more scientific basis.

The problem of draining marsh lands and of making our sandy lands more productive, is receiving such consideration as present equipment and means permit, but this work should be extended, for the reason that much time and money have been wasted by the people of this state in ill considered plans of draining swamp and low lands, and cultivating our sandy soils.

Many men in our state have spent the best years of their lives with their families on sandy lands, without sufficient knowledge to enable them to satisfactorily farm the same.

This department brings our university more closely in touch with the people than any other department, and, therefore, sufficient means should be provided to insure adequate facilities to carry on its work.

The buildings and equipment devoted to horticulture and soils are insufficient. There should be a separate building for each of these departments.

DEPARTMENT OF HORTICULTURE.

A. This department requires more room for a laboratory, in carrying on spraying and demonstration work, of sufficient size and specially constructed for this work and equipped with hot and cold water, steam, cement floors and drains.

B. The space for the green house should be materially increased; at the very lowest calculation at least from three to four times the present green house space is necessary, in order that the instructional and experimental work be properly done; there is also a need of a potting room which could be used for demonstration and laboratory work for plant propagation and floral culture. There should be erected a service building for the storage of implements and spraying machinery. At present there seems to be no particular place provided for the same. Additional space should be provided for lecture rooms, especially as this additional room is necessary during the short course which was demonstrated this year when the classes had to be split up, and part of them were forced to use the main agricultural hall.

C. The best results cannot be obtained in the main part of the horticultural building, owing to its location, as it is shaded to too great an extent in the early morning.

DEPARTMENT OF SOILS.

This department is now located in the same building with the horticultural department. At the time of the construction of this building, there was no special provision made for carrying on student work in the soils department. Now at least three hundred and fifty students of the short course, and seventy students of the long course, do regular work in the soils department under the most unfavorable circumstances for the want of space and sufficient light. If the present rate of increase in attendance is maintained during the next four years, there will be need of three times the present laboratory space.

We would recommend, or at least suggest, that the work of this department, if it is to be of the most satisfactory service in developing the agricultural resources of the state, should expand and cover a larger field.

1. By cooperating with the state geological survey in the work of making a soil survey. The two surveys could be made at the same time. A well conducted survey of the soils of the state, would greatly aid in studying the best methods for their improvement and management. There is a great demand for additional knowledge on the best methods of improving the marsh and swamp lands of the state, as well as the sandy soils, and also the soils exhausted from one cause or another, and to properly get this knowledge before the students and the

people, a soil survey should be organized and conducted in connection with the geological survey, and the legislature should be urged to make adequate provision for carrying on the same. Should this soil survey be made upon approved methods, a rejuvenation of the soils could easily be accomplished, thus preventing their impoverishment and the relegation of the state, agriculturally, to the down grade apparent in some of the eastern and southern states. This problem should not be neglected.

2. Extension in agricultural college extension: Only a very small proportion of the farmers, or farmers' sons, now attend an agricultural college; the bulletins issued from this department and distributed do not satisfactorily meet conditions, for the reason that many farmers do not get the bulletin, and a large percentage who do receive these bulletins, do not read them understandingly. Instruction in many lines must be given by actual demonstration, or by talks to the farmers in their community, in which local problems often play an important part. Personal investigations of the soils should be made, and supplemented by talks and instructions to the farmers in the community where the investigation has been conducted.

We would also suggest and recommend that a synopsis of the information embodied in the various bulletins issued from the agricultural college be periodically published in book form, so that the information may thus be preserved for ready reference.

Respectfully submitted,
M. J. WALLRICH,
BRUNO FINK,
JAS. H. ELMORE.

FARMERS' INSTITUTES—THE FARM AND DAIRY INSTRUCTION.

Your committee on farmers' institutes, the farm and dairy instruction, found itself constantly trespassing into other departments of the college of agriculture.

The college of agriculture stands on three legs, as it were,—teaching work, research work, and extension work. The committee's observations and investigations have been from these standpoints.

The agricultural college has had a remarkable growth in our state, and in recent years it has been so rapid that material resources have not been constructed fast enough to cover.

The college is equipped with a strong corps of teachers. The committee strongly approves of the policy which permits and encourages research work. To the state at large, as well as to the college, such work is bound to bring remarkable and far reaching results. Already we are informed that Wisconsin is being recognized as one of the foremost grain breeding states of the union due to the research work of Professor Moore.

The extension work has had and is having much to do in making the college of agriculture invaluable to the commonwealth.

We believe that the needs of this branch of our university will be taken care of consistently. When we realize that poultry products rank fourth in value of products consumed in the United States, a request for modest equipment to install a poultry department ought to meet with practically no opposition.

The committee has only words ot commendation for the work carried on in the various departments upon which it was directed to report.

Respectfully submitted,
W. J. PEARCE,
J. A. HAGEMANN,
A. C. PRESCOTT.

NATURAL SCIENCES.

Your committee on natural sciences reports as follows:

We found the science departments well equipped, thoroughly organized, and doing consistent work. The heads of the several departments show keen interest in their work, and carry this interest and enthusiasm into their class room and laboratories.

We are aware that the need for more room has been pointed out repeatedly by those in authority, and your committee firmly believes it is a need which cannot longer be put off without materially crippling the efficiency of some of these departments. The new growth in the long course in agriculture means additional room and additional courses in science. The time is not far distant when the university will have a department of plant pathology with a strong man at its head. And we are certain such a department will not only turn back to the state within a short time many fold the cost, but will minister to the needed growth of the science department.

The committee regrets to find the valuable museums of the science departments crammed into the attic of science hall. The committee firmly believes and recommends the planning and building of a biological building without delay.

Respectfully submitted,
A. C. PRESCOTT,
ANDREW D. AGNEW,
J. A. HAGEMANN.

ASTRONOMY AND MATHEMATICS.

Your committee on the departments of astronomy and mathematics submits the following report:

Members of this committee have visited the observatory, and have attended classes in mathematics and astronomy. We have also conferred with the professors at the head of these departments.

The committee found the teaching in the above named departments very satisfactory. The spirit of the classes was good and the instructors were doing effective teaching. The classes were of moderate size, which is of great importance, especially with first year students.

The committee was impressed with the very thorough organization of the mathematical department. The cost of instruction per pupil has been computed and a careful record kept of the same. A very complete record is kept of the work of each student. This is in a form readily available for use. Each professor and instructor has conference hours each week when pupils may come to him for assistance and advice. The work of the different classes in the same subject is carefully outlined. A close supervision is exercised over the work of younger instructors by the heads of the department, both as to the subject matter presented and as to the methods used.

Students entering the university for the first time, need the very best teaching which the state is able to furnish. They need to have the subject matter presented, carefully selected to fit their needs. They need clear, definite and forceful teaching. The committee feels that the success of this department along these lines is to be highly recommended.

The committee found the observatory well kept and well managed. Wisconsin has reason to be proud of the work done at Washburn observatory. Your committee is informed that there is a large and increasing amount of data in connection with the observatory which it is very desirable to have worked out, and that this could be done with a comparatively slight increase in the instructional force. It would seem to your committee to be the part of wisdom that this be provided.

The committee was very much interested in the effort of the department of mathematics to turn out students better prepared to teach mathematics, through the teachers' course now being offered. It can not fail to add to the effectiveness of mathematical work in the high school. This, in turn, affects the welfare of thousands of boys and girls each year.

On the whole, those departments make a very favorable impression on the visitor. They are well organized to do definite, effective work and to look after the welfare of the individual student.

Respectfully submitted,
H. S. YOUKER,
H. C. BUELL,
A. C. PRESCOTT.

COLLEGE OF ENGINEERING.

The undersigned members of the sub-committee on the college of mechanics and engineering most respectfully report that owing to the size of the college, the number of the faculty and students, and lack of time, we have not given the subject as careful attention as we should. So far as we have observed, we have nothing but compliments to bestow upon the college. We note with pleasure the effort that is being made to give efficient and practical instruction in hydraulics. In view of the changing conditions in Wisconsin, and particularly the northern part, and the numerous water powers within the state which can be utilized, we regard this of special importance, and trust that the efforts in this direction will be increased, and that further appropriations may be made.

We were pleased to observe the method and means for testing the tensile strength of steel, steel beams, and other apparatus, as well as the adhesive strength of cement and other like commodities. We were impressed with the view that the utility of these experiments to the people of the state, would be very much enhanced if it was better known that such facilities were provided, and that tests would be made for the people of the state which would be of a semi-official character.

The department of electrical engineering, which is closely allied to the development of the water powers of the state, is, we believe, already given the important consideration which it deserves.

Yours very truly,
L. K. LUSE,
J. A. HAGEMANN,
J. E. MCCONNELL.

STUDENT LIFE OF MEN.

The subject of the student life of young men should receive more than passing attention. It is second to none in importance. The class room is not all. Students spend the greater part of their time without its walls. Amid what surroundings and among what associates they are compelled to live in the formative period of their lives, means much to them. Religious and moral agencies have been established for their benefit, but nothing has been done in the way of providing for them a suitable place of abode and its accompanying advantages—a matter which seems to us to be of the most vital importance. Students must now find boarding and lodging places for themselves, where best they can. Frequently, they have to put up with very inferior accommodations amidst uncongenial surroundings. Isolated here and there they are deprived of one of the greatest pleasures and benefits of college life—the intimate companionship of their fellow students.

In the opinion of your committee, dormitories for men should be erected. We appreciate that this means a big undertaking, but we believe it to be a matter that should receive immediate attention and that steps should be taken to bring about its early consummation. In no other way is it possible to provide for all the students the proper social surroundings and congenial atmosphere which constitute such a vital and essential element in the growing life of young men. What a college graduate knows is important but not so important as what he is. And we believe that the helpful and broadening influences to be derived from the larger social intercourse, refined surroundings and congenial companionship of dormitory life would be of inestimable benefit to all the young men of the university.

Whether fraternities are desirable or not is a much mooted question. Probably the arguments against them out-weigh those in their favor. But under existing conditions they are perhaps on the whole a benefit in that they supply to a limited number, what all should be privileged to enjoy,—community student life.

Respectfully submitted,
ANDREW D. AGNEW,
W. J. PEARCE,
J. E. MCCONNELL.

STUDENT LIFE OF WOMEN.

Regretting that more time has not been given to visiting the university, we beg to submit the following report:

From the directory of students, we find that there are 794 women attending the university, of which 102 are accommodated in Chadbourne hall; 162 in the sorority houses; 187 live at home, leaving 343 to be cared for in boarding and rooming places.

At Chadbourne hall, the regulation that only freshmen and sophomore girls should be accommodated, has in our opinion, been wisely modified, and a limited number of junior and senior women have been assigned to the hall. The appointment of Mrs. Cora Stranahan Woodward as adviser of women, has assured a responsible leadership for the direction of a social life of the women. As advisor of the S. G. A. and a member of the faculty social committee, of which Prof. Sharp is chairman, she comes in contact with most of the young women. We think the registration of all young women with the advisor should be obligatory.

A resolution passed by the social committee insisting on separate boarding and rooming places for young women, goes into effect this fall, and the advisor is making provision for its enforcement.

Under the direction of the social committee, Mrs. Woodward sent communications to the boarding and rooming house keepers asking their preference for young men or young women as roomers, soliciting their cooperation in the enforcement of the regulations imposed by the faculty. Upon expression of willingness to adopt these regulations, lists have been prepared of recommended boarding and rooming places, whose owners have agreed to comply with the required conditions, viz., the accommodation of the young women alone, and the furnishing of a reception room on the first floor where young ladies may receive their callers. Circulars, stating these requirements and including such lists, have been mailed to parents, asking for their cooperation. The hearty response received has encouraged the social committee in the effort it has made for the betterment of rooming conditions. These homes are under her personal supervision. Cooperating with her, representatives of the S. G. A. meet the students at trains, assist them in finding homes, and see that they are properly registered.

The Self Government association laments an indifference to its work, and various methods of promoting unification among the women are under advisement. By issuing bulletins from time to time, it is proposed to keep the women informed of its work. In order that the association may stand for something more than the mere restriction in the form of rules, it is proposed to work on some larger lines, such as the establishment of a scholarship, the assistance of the university loan fund, or for a cooperative cottage system.

Efforts are being made to secure a lecture from Miss Jane Addams, and a delegate is to be sent to Milwaukee to take part in the discussion of the organization of a literary league to encourage original literary production among the women.

The women's building, to be added to the college group, will promote the social life among the non-sorority women, and supply the gymnasium so badly needed. But it will not relieve the pressure for dormitory accommodation. We, therefore, recommend that in the future plans be made to relieve a very grave situation, the cottage system be adopted, as being the least expensive and most effective, since the number can be gradually increased without any great appropriation for large buildings. Also, it may stimulate private efforts in the direction of building homes for non-sorority women, as has been done in the case of the sororities. We, however, feel that whenever cottages are to be built, they should be placed on university grounds, thus bringing them under university supervision as should have been done in the past with sorority and fraternity houses.

The regulations as to midweek parties are very generally observed. But the house parties held in fraternity houses during prom week still furnish a mooted question. Here the social committee is at variance with the opinion of many, and is loth to take a decided stand against them. They say that since the fraternity houses have been foisted upon the university by the alumni, the alumni should take the initiative in forbidding the use of these houses for such parties. It seems to us the question should be met fairly and squarely by the faculty and regents through the social committee since the results are directly under their observation, and the alumni should sustain whatever position they take. We believe the house parties have been for the most part conducted with decorum and under fairly good chaperonage, but we cannot commend the practice that prevails which necessitates the giving up of the house for the entertainment of the young women guests for a week end party. Students are compelled to give up their homes, remove their effects and crowd together wherever they can get accommodations, entailing confusion and discomfort which, added to the dissipation crowded into a few days, is too exhaustive and does not insure proper rest for either party. The house entertainments are too lavish and tend to an extravagance that many students and parents can ill afford, and which is severely censured by most parents. They are not necessary. Young ladies from away, who are allowed to attend the prom, must be entertained and properly chaperoned, but the parents should be charged with this responsibility and not the young men. Hotel and proper boarding places can always be secured, subject to the parents' approval.

Besides the question of house parties, there should be some regulations of the affairs of commencement week. The general impression exists that all rules are off, and infringement of good taste and propriety are reported. In investigating these reports, we find that the guests of commencement week are as culpable, or more so, than the students and over these persons the university has no control.

We recommend that the Pan-Hellenic take this matter under consideration and adopt a set of commencement week regulations for the sorority and boarding houses, which guests, in accepting the hospitality of the houses, will agree to observe.

The freshman year is a year of re-adjustment. Many students are illy prepared for the college work that they are to undertake. Social life should not distract the student from the real purpose for which he seeks the university. We feel the elimination of fraternity life during the freshman year, as is being done in many institutions, would strengthen the university by greatly aiding the students in this process of re-adjustment.

The health of young women should be of more concern. Good work cannot be done without a sound body and frail students should not be encouraged in pursuing regular college work. We deprecate, also, the seeking of the university for its social atmosphere. The elimination of the unsuitable student for whatever reason should be rigorously pursued without favoritism, particularly no "special quizzes" for the weaker sex.

For women, we do not advise segregation, rather elimination, but ask the maintenance of an equable standard by which men and women shall be impartially judged.

Respectfully submitted,
JULIET MEYER BROWN,
ROSE C. SWART,
ARABELLE S. BRANDENBURG.

SCHOOL OF EDUCATION AND HIGH SCHOOL INSPECTION.

Your committee on the departments of school of education and high school inspection submit the following report:

SCHOOL OF EDUCATION.

We are convinced that a good beginning has been made towards the establishment of an effective organization for the preparation of high school teachers. The strictly professional work of Drs. Elliott and O'Shea is practical and inspiring. It would seem desirable to devise some means whereby those students who are planning to go out into the high schools to teach, even for a short period of time, unless they have had previous normal school training, should receive more of this strictly pedagogical work. Scores of university students, who have failed utterly to catch the true spirit of teaching and who will inevitably find themselves in the schoolroom in the near future, could well receive the inspiration of this professional work, where they now receive but a minimum amount of it.

Teachers' Courses—Your committee found good teachers' courses conducted in Latin, English, botany, French, German, history, algebra, music and home economics. We regret that a good teachers' course should not be offered in physics, since every high school in Wisconsin requires a year's work in that subject for every graduate. We see little hope for science teaching in the Wisconsin high schools, while the science department of the university holds the untenable position that a knowledge of the subject matter by the teacher is all sufficient for the teaching of such an important subject as elementary physics.

Observation of High School Work—The committee has faith that great benefit will accrue from the observation work recently inaugurated in connection with the Madison high school. The conducting of regular high school classes in English by a member of the English department in the university, and the arrangement made with the regular high school teachers to give the students an insight into the plans, purposes and methods of the recitation, commends itself very favorably to the committee. We believe that an extension of the plans as contemplated with other university departments, will furnish suitable observation facilities for the present time but we believe, too, that this is but a beginning of a much larger field of usefulness in the future.

All these means, and others which may be devised, can but result in great advantage to the prospective teachers themselves, and to the classes which they will teach in their respective schools. We believe that the present plans, when sufficiently enlarged and perfected, will place the future teacher in an environment which cannot but direct his attention towards the teaching profession and its problems, so that a much stronger body of young teachers will be sent forth each year with an attitude towards the work of the teaching profession, and a training for the profession, which will do more to improve the high school teaching than anything which the university has yet attempted.

HIGH SCHOOL INSPECTION.

This department naturally comes in to the closest possible relation with the high schools of the various cities and communities of the state. That the inspectors in the discharge of their duties should meet with more or less friction is probably inevitable. That many school authorities in the organization of their high school to meet local demands and conditions, both as to the school curriculum and the personnel of the teaching force, should fail to satisfy the demands of the university is also doubtless inevitable. The university has been somewhat hampered in not having a sufficient number of men, of intimate acquaintance with the high school conditions and view point, who are free from university duties long enough to do thorough, consistent and comparative inspection work. A closer organization of this work, whereby men who are specially interested in the high school teachers' courses could be given enough inspection work to form a fair estimate of related work in different schools, would seem to be a better plan than the present one. Your committee is of the opinion that great benefit would come to both classes of institutions, if more of the feeling could become prevalent that the university visitor had come in the attitude of an elder brother coming to help the young teacher. At the present time, there is an altogether too common feeling that the inspector is a public educational detective, whose chief duty it is to point out faults and to demand that the high school authorities remove from their corps of teachers those found wanting. This has not been the case frequently where the regular university inspector, Mr. Tressler, has visited the schools in person. The committee is firmly of the opinion that a regular corps of inspectors, who could visit many schools, would be a great improvement over the present rather chaotic system. We understand that such an arrangement has been contemplated, if so, we heartily approve of it.

DEPARTMENT OF CORRESPONDENCE.

This method of study, so comprehensive in its scope and so democratic in its character, cannot but appeal to any one interested in the cause of education as a highly desirable project to be undertaken by a university. The department of correspondence is apparently working out a valuable system of instruction. We desire to commend the efficiency with which the work has been inaugurated as well as the spirit which actuates every member of the department. It is doubtful if any department in the university has any greater possibilities for touching the great masses of people than has this department. The members of the committee are strongly drawn towards the correspondence idea, and to the particular department as it has grown and developed in the short period of its existence.

Respectfully submitted,

H. C. BUELL,
H. S. YONKER,
ROSE C. SWART.

GRADUATE DEPARTMENT AND SUMMER SCHOOL.

Your committee was not able to ascertain the facts concerning these departments by actual visitation. We feel, however, that a great and useful work is being done in both of them. Regarding the graduate department there can be no question that the work done in the realm of original research and investigation in some departments has brought large monetary, scientific returns to the state. The president and heads of the departments are apparently using due caution in holding this work in subordination to the undergraduate work.

Respectfully submitted,

H. C. BUELL,
H. S. YONKER,
MRS. JULIET D. BROWN.

SCHOOL OF MUSIC.

As chairman of the visiting committee I beg leave to report as follows upon the school of music of the University of Wisconsin.

We find that the school is growing, both in the scope of its work as well as in the attendance of students. In addition to the students in the academic department about two hundred students in the university proper have matriculated therein this year.

Among the new features introduced, and to be introduced, that of so called artists' recitals is very important. The best talent obtainable with the means at command, is brought to the institution for concerts and recitals, the programs of which are varied and instructive. Among the artists to appear are Rudolph Ganz, pianist; Holmes Cowper, tenor; Walter Spry, pianist; Willy Jaffe, violinist; Jaffe's string quartette; Miss L'Hommedieu, vocalist. The students of the school of music are expected to attend these recitals and concerts.

A second feature designed to benefit the general student body is a course of lectures during the first semester on "Musical Appreciation", and a second course, for the second semester, on "Masterpieces of Music", being a course of critical analysis of the works of the great composers. A thematic music player, for illustrating the lectures, would be of great value, and is greatly desired in connection with the work. In order to reach the largest possible number of students a system of credits has been established, which will no doubt meet with a very favorable response.

There is great need of an auditorium where students can meet as a student body for entertainments, recitals and concerts. The present auditorium will accommodate but one thousand students when crowded to its greatest capacity, whereas seats for at least two thousand should be provided. Such a hall would have great influence for good and would materially enhance the scope of the work outlined for the school. Besides being entirely inadequate for even the present requirements as to seating capacity, the present building is a fire trap of the most dangerous sort owing to its narrow exits and stairways.

At least four new pianos should be provided without delay, to replace an equal number of absolutely worn out instruments now in daily use in this building. It is inconceivable that these decrepit pianos should be permitted to remain where they are, as the culture of musical feeling becomes very difficult under such circumstances.

The organ now in the building answers fairly well for practice work, but is entirely inadequate for the purpose of concert work such as becomes necessary in conjunction with the musical education which the students have a right to expect in this department of the University of Wisconsin. A new concert organ should therefore be supplied as soon as possible.

Yours very truly,
BRUNO FINK,
ARABELLE S. BRANDENBURG.

FINANCE.

The visiting committee charged with the duty of considering the management of the university finances and business methods, begs leave to report that the system of book-keeping upon which the committee of last year reported at great length, is now in good and well settled shape and that there is every evidence of its being faithfully and carefully followed, in other words, that for an institution of this kind, it is about as good as it could be.

The committee believes the management of the funds of the university to be in good hands and well administered.

Respectfully submitted,
BRUNO FINK,
JAS. H. ELMORE,
J. E. McCONNELL.

COURSE IN COMMERCE.

We beg leave to report the following observations, made in the course of a visit paid to the University of Wisconsin by the committee on the course in commerce.

This course has been in existence but a few years and at the beginning there were doubts as to just what it should cover, but experience has pointed out the needs of the school and given systematic shape to the work in hand. While the course is an exacting and strenuous one, it is so modified in suiting the needs of young men seeking training in particular lines of business, that it is now looked upon as a strong and valuable course in the university.

At the present moment the course in commerce finds itself face to face with the possibility of losing the services of one of its foremost instructors in the department of accounting and auditing. We refer to Assistant Professor Gilman who, for a consideration of but $1,800 per annum, has been sacrificing much of the time and income of his law practice, in order to give regular lectures to the students in that most important branch of the school of commerce. With the growth of the work in hand, the demand upon Professor Gilman's time and services has become so exacting that in justice to himself and to the university he should henceforth devote his entire energies to the school of commerce. This, however, he cannot afford to do for the salary of but $1,800 per annum, and therefore, unless it is raised to at least $3,000 a year, he will, so we are informed, sever his connection with the university. A way out of the difficulty has been suggested, and is recommended to the favorable action of the regents by the president of the university and by the dean of the college. It is that, in order to make up this salary of $3,000, it be apportioned as follows: $2,500 to be paid out of the funds allotted to the course in commerce, Prof. Gilman in return to lecture in this course five days in the week, and $500 to be paid by the State Railway commission, the professor to devote one day in each week to the service of the commission. It is the opinion of the committee of the faculty that without Prof. Gilman, the work of the course in commerce, and particularly of the department of accounting and auditing, would be seriously crippled.

The salary of Student Assistant Slade, now $200.00 should be raised to $500.00 per annum, in order that at least a reasonably fair compensation be given for the excellent work that is being done by Mr. Slade. This increase is urgently recommended by the committee of the faculty.

At the present time two hundred and twenty-two students are enrolled in the four years' course in commerce, and it is safe to assume that, in keeping with this steady growth in attendance, the present quarters of the school, already too small, will be entirely inadequate to the demand for room. The present structure now houses respectively the government weather bureau, the course in German and the course in commerce. In view of the reasons aforementioned, it is imperative that the weather bureau should be removed to another building in order that the quarters now occupied by it be placed at the disposal of the course in commerce. This would give the latter one large room, of which it stands in great need for the purpose of housing the Commercial Museum which has been steadily growing and is an attractive and valuable adjunct to the course in commerce.

In the department of advertising and salesmanship there is great need of maintaining and, if possible, increasing the lecture fund, in order that the students may have the benefit of frequent lectures upon this subject by experts, as otherwise the work will lag. Many more things are required, but the committee considers the Gilman matter of first importance, for, unless favorable action be had thereon, the work will probably have to be dropped, and this would be a serious loss to the school of commerce and greatly decrease its value as a factor in the commercial education of the students of the University of Wisconsin.

Yours very truly,

BRUNO FINK,
J. H. ELMORE,
ANDREW D. AGNEW.

COURSE IN DOMESTIC SCIENCE.

The committee on home economics begs to report that after painstaking investigation, it concludes:

That the department of home economics needs enlargement. It should be supplied with at least an additional instructor. It is desirable that this instructor should, as a special duty, be required to carry to the young women throughout the state, in the form of lectures delivered in the various communities, a knowledge of the value and practicability of the work in this most useful art that is being done at the university and awaken in them an anthusiasm to take advantage of the opportunities here offered. It is not attracting to a satisfactory or desirable extent. Students are fewer now than during the first year of its existence. To the present time the attendance has been: 1904-5, 113; 1905-6, 69; 1906-7, 72; 1907-8, 85.

These statistics are significant and seem to indicate that the course really is filling a want, but your committee believes that the numbers should be multiplied largely, and could be without adding greatly to the expense of the department.

The course, your committee believes, should be dignified, to the end that young women may major in it, may secure degrees for efficient work in it, and obtain such learning as will equip them to become teachers themselves in the art. Our young men are drifting rapidly toward the engineering courses; let us foster here another science—one that may become particularly attractive to our young women, and one that seems to accord naturally with their capabilities and with their inclinations. In conjunction with this course should be established a branch in art, that kind of art which has to do especially with the home and its adornment. Entrance to the course should be simplified. Young women qualified to gain admittance to the university should at once be entitled to enrollment in this course, regardless of their knowledge of chemistry or other specialties. No freshman can enter the course now, because of lack of credits in certain sciences. This disbarment should not exist. The course is profoundly practical. Technicalities should not be permitted to enforce exclusion from it.

Concurrent with the short course in agriculture, might advantageously be conducted also a short course in domestic science of practical and rudimentary character. Let the university help the farmer's daughters as well as the farmer's sons. Here is the opportunity.

Your committee is pleased to express its commendation of the excellent progress made and results attained by Miss Hunt, with her assistant, in the so-called housekeepers' conference.

Respectfully submitted,

ARABELLE S. BRANDENBURG,
JULIET MEYER BROWN,
ROSE C. SWART.

REPORT OF THE TREASURER

MADISON, WIS., Dec. 7, 1908.

HON. W. D. HOARD,
President of the Regents of the University of Wisconsin.

DEAR SIR:—I have the honor to submit herewith my report as treasurer of the board of regents of the University of Wisconsin for the fiscal years ending June 30th, 1907, and June 30th, 1908.

Very truly yours,
A. H. DAHL,
State Treasurer.

UNIVERSITY FUND INCOME

RECEIPTS.	1907	1908
Received from interest on land contracts	$102 51	$87 98
Received from interest on loans	2,951 74	3,194 90
Received from interest on bonds	890 00	892 50
Received from interest on state deposits	1,478 18	1,901 90
Received from interest on certificates of indebtedness	7,770 00	7,770 00
Received from refund warrant No. 9464	2,800 00	....
Received from refund warrant Moody	....	50 00
Received from refund drafts	50 93	....
Received from United States government	52,000 00	54,000 00
Received from general fund Building App'n.	200,000 00	137,774 76
Received from general fund loan	240,000 00	250,000 00
Received from general fund Agricultural Inst.	12,000 00	20,000 00
Received from general fund Washburn Observatory	3,000 00	3,000 00
Received from Agricultural College income	13,111 67	13,038 27
Received from Secretary of Regents	222,020 97	257,075 01
Tax	607,085 00	644,657 00
Received from general fund University Extension	....	20,000 00
Received from general fund Women's Building	....	2,100 91
Total	$1,365,261 00	$1,415,543 23

UNIVERSITY FUND INCOME—continued

DISBURSEMENTS.	1907	1908
University pay roll	$1,120,732 13	$1,085,635 80
Insurance	3,846 56	4,145 34
Interest on loan from general fund	1,736 52	1,327 98
Loan from general fund	240,000 00	250,000 00
Total	$1,366,315 21	$1,341,109 12
RECAPITULATION.		
Balance on hand June 30, 1906	$26,594 97	....
Receipts for two years	2,780,804 22	....
Disbursements for two years	....	$2,707,424 33
Balance on hand June 30, 1908	....	99,974 86
Total	$2,807,399 19	$2,807,399 19

REPORT OF THE TREASURER

MADISON, WIS., Dec. 7, 1908.

HON. W. D. HOARD,
President of the Regents of the University of Wisconsin.

DEAR SIR:—I have the honor to submit herewith my report as treasurer of the board of regents of the University of Wisconsin for the fiscal years ending June 30th, 1907, and June 30th, 1908.

Very truly yours,
A. H. DAHL,
State Treasurer.

UNIVERSITY FUND INCOME

RECEIPTS.	1907	1908
Received from interest on land contracts	$102 51	$87 98
Received from interest on loans	2,951 74	3,194 99
Received from interest on bonds	800 00	802 50
Received from interest on state deposits	1,478 18	1,991 80
Received from interest on certificates of indebtedness	7,770 00	7,770 00
Received from refund warrant No. 9464	2,800 00	....
Received from refund warrant Moody	....	50 00
Received from refund drafts	50 93	....
Received from United States government	52,000 00	54,000 00
Received from general fund Building App'n.	200,000 00	137,774 76
Received from general fund loan	240,000 00	250,000 00
Received from general fund Agricultural Inst.	12,000 00	20,000 00
Received from general fund Washburn Observatory	3,000 00	3,000 00
Received from Agricultural College income	13,111 67	13,038 27
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UNIVERSITY FUND INCOME—continued

DISBURSEMENTS.	1907	1908
University pay roll	$1,120,732 13	$1,085,635 80
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Total	$2,807,399 19	$2,807,399 19

FINANCIAL CONDITION

REPORT OF THE SECRETARY.

MADISON, WIS., June 30, 1908.

HON. W. D. HOARD,

President of the Regents of the University of Wisconsin.

SIR:—I submit herewith the financial report of the secretary of the university for the biennial period closing June 30, 1908.

The report consists of the following statements:

I. Receipts and disbursements for the fiscal years 1906–7, 1907–8.

II. Details of disbursements for each college, or main account, by classification or sub-account, and recapitulation of disbursements by sub-account for each year.

III. Statement of assets and liabilities taken from our books as of June 30, 1908.

IV. University trust funds.

V. Appendix A. Details of disbursements to individuals or firms. Appendix B. Details of pay rolls.

Respectfully,

M. E. McCAFFREY,

Secretary.

UNIVERSITY FINANCES, 1906-7.

RECEIPTS

From state appropriations—	
2-7 mill tax	$607,085 00
Agricultural institute, Chap. 62, Laws 1887	12,000 00
Washburn observatory, Chap. 418, Laws 1887	3,000 00
Special appropriation, Chap. 320, Laws 1905	200,000 00
From U. S. appropriations—	
For experiment station, (Hatch Fund)	15,000 00
For Agriculture and mechanic arts, (Morrill Fund)	25,000 00
For agricultural college, (Adams Fund)	12,000 00
From productive funds—	
University fund	13,192 43
Agricultural college fund	13,111 67
From miscellaneous—	
Deposits by bursar, account students' fees—	
Law	6,860 00
Incidental	58,950 50
Non-resident	14,522 50
Chadbourne hall	8,454 85
Summer session	8,038 40
University extension	309 50
Gymnasium and locker fees, receipts from games; $3,945.50 of this amount was deposited twice, owing to changes in method of handling athletic funds	17,810 02
Pianos and organ rent	515 75
From students for laboratory supplies	31,492 39
From students for library fines, etc	42 27
Agricultural college sales, proceeds of material, after having been used for experimental purposes	66,973 83
Horse breeding permits	1,359 10
Soils department	180 00
Farmers' institute ,advertising and sale of bulletins	759 66
U. S. department of agriculture	600 00
Northern sub stations, (A. R. Whitson), refund of cash advanced for traveling expenses	300 00
Institute salaries refunded	180 00
Miscellaneous agricultural college	108 90
Salary refund, Professor Lathrop	190 00
Draft No. 53379 returned to state treasurer on account of withdrawal of condemnation proceedings Gratz property	2,800 00
Salary refund, Jesse Wrench	40 00
Other refunds	10 93
Sale of old furniture at auction	31 64
Rents of university buildings	1,040 50
State historical society, gas and current	242 87
Belle C. Crowe, matron Chadbourne hall	1,211 59
Chas. R. Van Hise, gas and current	157 15
Sale of old iron and cinders	398 40
Sale of kindling	74 80
Freight refunded	71 54
Wm. Keyes, old coal wagon boxes	65 00
Sale of hay and shrubs	17 50
*Sale of university publications	53 48
Insurance premiums refunded	47 20
All other sources	78 63
Halle Steensland, prize fund	100 00
F. W. Allis, graduate scholarship	200 00
Guido C. Vogel, scholarship	280 00
*Sale of team	225 00
	$1,125,261 00

DISBURSEMENTS

Agricultural college and experiment station	$197,314 66
College of letters and science	366,022 18
College of engineering	134,417 46
Military department	3,050 89
Administration	34,871 15
College of law	30,677 36
Physical culture	39,889 65
General account	45,021 61
Observatory	7,262 12
Chadbourne hall	13,496 55
General library	46,692 31
Laboratory supplies	30,842 59
Fire protection	1,502 84
University extension	4,828 78
Chemical equipment	1,339 96
School of economics library fund	....
New central plant	730 81
University hall, north wing	52,243 30
Agricultural engineering building	34,220 22
Agronomy building	28,905 37
Hill railway library fund	1,480 55
Fees refunded	2,328 60
Trostel prize fund	80 00
Vogel fellowship	280 00
North wing equipment	9,691 99
University grounds	36,318 11
F. W. Allis, scholarship	200 00
Henry Gund, scholarship	250 00
Kletzsch, fellowship fund	23 00
Piano account	396 75
Agricultural engineering building equipment	9 68
Agronomy building equipment	10 85
Steensland prize fund	70 00
Cream City prize	100 00
	$1,124,578 69

SUMMARY, 1906-7

	Receipts.	Disbursements.
Total receipts for the year 1906-7	$1,125,261 00	....
Total disbursements for the year 1906-7	....	$1,124,578 69
Balance June 30, 1906	26,594 97	....
Interest paid on loan from general fund	....	1,736 52
Balance June 30, 1907	....	25,540 76
	$1,151,855 97	$1,151,855 97

UNIVERSITY FINANCES, 1907-8.

RECEIPTS

From state appropriations—	
2-7 mill tax	$644,657 00
Agricultural institute, Chap. 318, Laws 1907	20,000 00
University extension, Chap. 413, Laws 1907	20,000 00
Washburn observatory, Chap. 418, Laws 1887	3,000 00
Special appropriation, Sec. 3, Chap. 428, Laws 1907 ($200,000 building fund)	137,774 76
Special appropriation, Sec. 4, Chap. 428, Laws 1907 (Women's building)	2,100 91
From U. S. appropriations—	
Agricultural experiment station, (Hatch fund)	15,000 00
Agriculture and mechanic arts, (Morrill Fund)	25,000 00
Agricultural experiment station, (Adams Fund)	9,000 00
Agricultural experiment station, (Nelson Fund)	5,000 00
From productive funds—	
University fund	13,873 52
Agricultural college fund	13,038 27
From miscellaneous—	
Deposits by bursar, account students' fees—	
Law	2,828 25
Letters and science	34,115 50
College of engineering	26,325 50
College of agriculture	5,476 00
Non-resident	18,035 00
Gymnasium and locker fees	7,165 25
Piano and organ rent	510 75
Chadbourne hall	8,246 50
Summer session	9,657 00
University extension	2,510 96
From students for laboratory supplies	34,000 00
From students for library fines, etc.	87 99
Salary refund O. H. Ensign	350 00
Paul Sladky	10 00
W. H. Williams	400 00
H. A. Watt	40 00
W. D. Frost	20 00
W. H. Partridge	50 00
American bureau of industrial research for one-half salary of J. B. Andrews	500 00
From agricultural college sales, proceeds of material after having been used for experimental purposes	91,850 55
Farmers' institute, advertising and sale of bulletins	929 06
Horse breeding permits	2,778 47
Nursery inspection	340 00
Soils department	440 06
Miscellaneous, agricultural college	101 00
From sale of cinders	1,225 10
Belle C. Crowe, matron Chadbourne hall	1,027 49
state historical society, gas and current, etc	1,339 01
Charles R. Van Hise, gas and current	380 44
sale of old furniture, etc	59 62
sale of kindling	64 51
sale of old Corry houses (part)	831 00
sale old dray	55 00
university orchestra, $22.38; junior prom committee, $161.21	183 59
sale of old iron, $247.17; waste paper, $11.61	258 78
sale of hay	6 25
deposit by graduating class for memorial fountain	132 83
rents of university houses	1,629 54
sales of university publications, $67; syllabi, $141.56	208 56
refund of freight, etc	165 30
all other sources	21 15
F. W. Allis, Lillian Page Allis scholarship	150 00
James J. Hill, library fund	2,000 00
B. F. McMillan, scholarship correspondence school	50 00
	$1,165,569 47

DISBURSEMENTS

Agricultural college and experiment station	$240,736 74
College of letters and science	382,429 04
College of engineering	129,986 79
Administration	29,925 83
Laboratory supplies	32,649 11
College of law	24,716 28
Physical culture, men	20,342 56
Physical culture, women	3,843 75
General account	45,782 38
Observatory	6,921 97
Chadbourne hall	11,180 93
General library	43,553 15
Military department	2,706 79
University extension	18,606 82
Architect's office	3,947 40
Fees refunded	1,938 55
University grounds	3,401 75
Piano account	1,193 14
James J. Hill, railway library fund	1,526 46
Women's building	2,112 39
Tunnels	210 01
New central heating plant	46,645 90
Addition to administration building	9,899 85
Store room (Credit, $449.25)	1,700 89
Agricultural engineering building	9,184 42
Agronomy building	5,848 82
Agricultural engineering building equipment	4,540 57
Agronomy building equipment	3,066 10
Trostel prize fund	250 00
North wing equipment	653 03
Kletzsch fellowship fund	3 71
Henry Gund scholarship	25 00
F. W. Allis scholarship	150 00
Henry Wergeland scholarship	200 00
Horse pavilion, animal husbandry building	608 29
Equipment, administration building	591 75
	$1,091,135 37

SUMMARY, 1907-8.

Total receipts for the year 1907-8	$1,165,569 47	....
Total disbursements for the year 1907-8	....	$1,091,135 37
Balance June 30, 1907	25,540 76	....
Balance June 30, 1908	....	99,974 86
	$1,191,110 23	$1,191,110 23

RECAPITULATION

Total receipts for two years	$2,290,830 47	....
Total disbursements for two years	....	$2,215,714 06
Interest paid on loan from general fund	....	1,736 52
Balance June 30, 1906	26,594 97	....
Balance June 30, 1908	....	99,974 86
	$2,317,425 44	$2,317,425 44

DETAIL OF DISBURSEMENTS FOR FISCAL YEAR ENDING JUNE 30, 1907.

COLLEGE OF AGRICULTURE.

Salaries	$53,982 97	
Repairs and improvements	5,170 35	
Heat, light and water	8,293 42	
Insurance	789 36	
Postage and stationery	4,732 83	
Furniture	1,400 78	
Traveling expenses	2,105 41	
Clerks and stenographers	6,084 03	
Janitors	2,661 68	
Books and binding	963 16	
Labor	15,231 04	
Seeds, plants and sundry supplies	4,763 84	
Tools, implements and machinery	2,939 97	
Feeding stuffs	4,572 28	
Scientific apparatus	3,116 04	
Live stock	1,783 80	
Chemical supplies	2,109 48	
Contingent expenses	361 54	
Freight and express	2,026 53	
Publications	1,235 08	
Fencing and drainage	10 00	
Dairy tests	2,832 08	
Inspection of feeding stuffs and fertilizers	221 06	
Agricultural institutes	11,959 69	
Milk	44,492 39	
Roads, grounds and cement sidewalks	598 75	
Tobacco investigation	1,744 56	
Cranberry investigation	1,966 91	
Sub-stations	5,599 09	
Live stock, special $10,000	185 00	
Soil investigation	3,076 13	
Whitson, expenses	300 00	
Total		$197,314 06

COLLEGE OF LETTERS AND SCIENCE.

Salaries	$270,801 21	
Apparatus, general	913 11	
Physics apparatus	978 08	
Botany apparatus	655 68	
Chemical apparatus	606 36	
Geology apparatus	1,653 01	
Zoology apparatus	859 27	
Psychology apparatus	443 54	
Bacteriology apparatus	844 45	
Anatomical apparatus	1,162 73	
Pharmacy apparatus	267 26	
Erlanger apparatus	2,830 60	
Home economics apparatus	685 71	
Repairs and improvements	20,212 26	
Heat, light and water	31,584 43	
Insurance	1,522 06	
Postage and stationery	937 81	
Printing and advertising	83 40	
Furniture	3,585 04	
Traveling expenses	154 71	
Clerks and stenographers	3,306 60	
Janitors	6,129 59	
Incidentals	651 65	
Research fund	259 58	
Summer session	9,513 47	
Museum	134 96	
Hygienic	1,518 60	
Dean's contingent	23 78	
Apparatus, special $4,000	3,206 31	
Commerce apparatus, Taylor	172 97	
Commerce apparatus, Burchell	145 00	
Education apparatus	128 95	
Total		$366,022 18

COLLEGE OF ENGINEERING.

Salaries	$70,891 00	
Apparatus	14,208 49	
Repairs and improvements	3,519 23	
Heat, light and water	15,156 52	
Insurance	570 77	
Postage and stationery	397 00	
Printing and advertising	446 79	
Furniture	325 23	
Traveling expenses	852 22	
Clerks and stenographers	928 33	
Janitors	3,745 46	
Incidentals	254 76	
Research fund	4,027 67	
School for artisans	3,245 00	
Hydraulic laboratory building	12,018 60	
Repairs old chemical building	3,544 52	
Hydro. $900 appropriation	236 12	
Electrical exposition	49 75	
Total		$134,417 46

MILITARY DEPARTMENT.

Salaries	$135 00	
Field officers' prizes	150 00	
Repairs and improvements	17 10	
Postage and stationery	42 25	
Clerks and stenographers	90 00	
Incidentals	1,362 48	
Band	652 06	
Commutation of quarters	432 00	
Fees refunded	170 00	
Total		$3,070 89

ADMINISTRATION.

Heat, light and water	$45 88	
Postage and stationery	553 00	
Clerks and stenographers	1,575 00	
Incidentals	475 19	
President's contingent	1,093 68	
Expenses of regents	1,066 19	
Expenses of visitors	419 76	
President's office, salaries	8,170 00	
President's office, postage and stationery	238 95	
Auditor's office, salaries	1,841 97	
Auditor's office, postage and stationery	260 50	
Regents' office, salaries (including clerks and stenographers)	10,741 24	
Regents' office, postage and stationery	647 50	
Registrar's office, salaries	4,225 02	
Registrar's office, postage and stationery	1,440 07	
Registrar's assistants	485 62	
Accounting outfit	1,559 47	
Auditor's office, incidentals	4 71	
Architect's office, postage and stationery	27 40	
Total		$34,871 15

COLLEGE OF LAW.

Salaries	$19,116 92	
Student assistance	23 25	
Repairs and improvements	2,215 18	
Heat, light and water	2,226 83	
Insurance	190 26	
Postage and stationery	237 38	
Printing and advertising	54 27	
Furniture	8 40	
Clerks and stenographers	682 12	
Janitors	342 51	
Incidentals	25 40	
Summer session	31 15	
Books and binding	5,523 60	
Total		$30,677 36

PHYSICAL CULTURE.

Salaries	$10,203 96	
Apparatus	570 81	
Repairs and improvements	3,298 92	
Heat, light and water	12,167 80	
Insurance	304 41	
Postage and stationery	171 95	
Furniture	39 30	
Clerks and stenographers	23 00	
Janitors	1,330 47	
Incidentals	3,852 71	
Athletics	7,922 52	
Special crew subscription, refund	3 80	
Total		$39,889 65

GENERAL ACCOUNT.

Salaries	$4,598 16	
Repairs	6,904 79	
Heat, light and water	6 00	
Insurance	27 20	
Postage and stationery	380 22	
Printing and publications	9,568 04	
Furniture	442 95	
Janitors	771 75	
Incidentals	3,250 22	
Interest	1,300 00	
Roads and grounds	8,736 58	
High school inspection	1,071 13	
Maintenance president's house	728 11	
Commencement, etc.	837 51	
Graduate department	765 04	
Athletics	578 79	
Architect's office	200 95	
Dray	838 06	
Team and labor	1,403 41	
Telephones	1,019 91	
Laird account	1,482 79	
Total		$45,021 61

WASHBURN OBSERVATORY.

Salaries	$5,000 00	
Apparatus	75 60	
Repairs and improvements	611 89	
Heat, light and water	389 63	
Insurance	152 20	
Postage and stationery	97 92	
Furniture	25 00	
Clerks and stenographers	341 24	
Janitors	545 00	
Incidentals	23 64	
Total		$7,262 12

CHADBOURNE HALL.

Salaries	$1,313 00	
Refund of room rent	5 15	
Repairs and improvements	1,224 71	
Heat, light and water	8,480 94	
Insurance	304 41	
Postage and stationery	10 00	
Furniture	206 29	
Janitors	1,874 48	
Incidentals	77 57	
Total		$13,496 55

GENERAL LIBRARY.

Salaries	$13,566 72	
Repairs and improvements	34	
Heat, light and water	10,196 20	
Postage and stationery	391 07	

Furniture	16 49	
Incidentals	1 15	
Books and binding	20,556 42	
Books, European history	1,933 97	
Maintenance library building	29 95	
Total		$46,692 31

LABORATORY ACCOUNTS.

Chemical laboratory supplies	$15,338 63	
Physics laboratory supplies	2,846 72	
Botany laboratory supplies	987 03	
Bacteriology laboratory supplies	653 67	
Engineering laboratory supplies	7,712 42	
Psychology laboratory supplies	36 06	
Mineralogy laboratory supplies	100 28	
Geology laboratory supplies	101 69	
Anatomical laboratory supplies	748 04	
Zoology laboratory supplies	962 53	
Home laboratory supplies	51 90	
Correspondence laboratory supplies	170 50	
Lecture laboratory supplies	1,105 91	
Erlanger laboratory supplies	6 80	
Business laboratory supplies	20 41	
Total		$30,842 59

UNIVERSITY EXTENSION.

Salaries	$2,832 51	
Postage and stationery	910 58	
Printing and publications	361 99	
Traveling expenses	333 10	
Clerks and stenographers	183 20	
Incidentals	207 35	
Total		$4,828 73
Fire protection		$1,502 84
Chemical building equipment		1,379 96
New central heating plant		730 81
University hall, north wing		52,243 20
Agricultural engineering building		34,220 32
Agronomy building		28,905 37
J. J. Hill railway library fund		1,480 85
Fees refunded		2,328 60
Trostel prize fund		80 00
Vogel fellowship		280 00
North wing equipment		9,691 99
University grounds		26,318 11
F. W. Allis scholarship		200 00
Henry Gund scholarship		250 00
Gustave Kletzsch fellowship fund		23 00
Piano account		395 75
Agricultural engineering building equipment		9 08
Agronomy building equipment		10 85
Steensland prize fund		70 00
Cream City prize fund		100 00
Total expenditure for year		1,124,578 69

RECAPITULATION OF EXPENDITURES BY SUB-ACCOUNTS FOR THE YEAR ENDING JUNE 30, 1907.

Salaries	$452,441 45
Apparatus	15,768 01
Physics apparatus	978 08
Botany apparatus	655 68
Chemical apparatus	603 36
Geology apparatus	1,653 01
Zoology apparatus	850 27
Psychology apparatus	443 54
Student assistance	23 25
Zoology laboratory supplies	962 53
Field officers' prizes	150 00
Chadbourne hall rent refund	5 15
Bacteriology apparatus	844 45
Anatomical apparatus	1,162 73
Pharmacy apparatus	267 26
Erlanger apparatus	2,880 60
Home economics apparatus	685 71
Repairs and improvements	43,174 77
Heat, light and water	88,487 65
Insurance	3,860 67
Postage and stationery	8,862 01
Printing and advertising	10,514 49
Furniture	6,109 48
Traveling expenses	3,445 41
Clerks and stenographers	13,213 52
Janitors	17,400 94
Incidentals	10,182 12
Research fund	4,287 25
Summer session	9.544 62
School for artisans	3,245 00
Museum, etc.	134 96
Hygienic	1,518 60
President's contingent	1,093 68
Expenses of regents	1,063 19
Expenses of visitors	419 76
Books and binding	27,049 27
Interest	1,300 00
Band	652 06
Chemical laboratory supplies	15,338 63
Physics laboratory supplies	2,846 72
Botany laboratory supplies	987 03
Bacteriology laboratory	653 67
Engineering laboratory supplies	7,712 42
Psychology laboratory supplies	36 06
Mineralogy laboratory supplies	100 28
Geology laboratory supplies	101 69
Anatomical laboratory supplies	748 04
Home laboratory supplies	51 90
Roads and grounds	8,736 58
High school inspection	1,071 13
Maintenance of president's house	728 11
Commencement, etc.	887 51
Labor	15,231 04
Seeds, plants and sundry supplies	4,763 34
Tools, implements and machinery	2,939 97
Feeding stuffs	4,572 28
Scientific apparatus	3,116 04
Live stock	1,783 80
Chemical supplies	2,109 48
Contingent expenses	361 54
Freight and express	2,026 53
Publications	1,235 08
Fencing and drainage	10 00
Dairy tests	2,832 08
Inspection of feeding stuffs and fertilizers	221 06
Agricultural institutes	11,959 60
Milk	44,492 39
Roads, grounds and cement walks	598 75
Tobacco investigation	1,744 56
Cranberry investigation	1,906 91
Northern sub-stations	5,590 09
$10,000 special appropriation for live stock	185 00
Books, European history	1,933 97
Dean's contingent L. & S.	23 78
Hydraulic laboratory building	12,018 60

Repairs, old chemical building	$3,544 53
$900 hydraulics, special appropriation	236 12
Commutation of quarters	432 00
President's office, salaries	8,170 00
President's office, postage and stationery	238 95
Auditor's office, salaries	1,841 97
Auditor's office, postage and stationery	260 50
Regents' office, salaries	10,741 24
Regents' office, postage and stationery	647 50
Registrar's office, salaries	4,225 08
Regents' office, postage and stationery	647 50
Registrar's assistants	485 62
Graduate department	765 04
Athletics	8,501 81
Architect's office	260.95
Maintenance library building	29 95
Soils investigation	3,076 13
Whitson, expenses	800 00
Electrical exposition	49 75
Dray	838 06
$4,000 apparatus, special apparatus	3,206 31
Accounting outfit	1,559 47
Commerce apparatus, Taylor	172 97
Commerce apparatus, Burchell	145 00
Educational apparatus	128 95
Auditor's office, expenses	4 71
Architect's office, postage and stationery	27 40
Team and labor	1,403 41
Telephones	1,019 91
Laird & Cret. account	1,482 79
Fees refunded, military department	170 00
Correspondence laboratory supplies	170 50
Lecture laboratory	1,105 91
Erlanger laboratory supplies	6 80
Special crew subscription, refund	8 80
Business laboratory supplies	20 41
Fire protection	1,508 84
Equipment chemical building	1,339 96
New central heating plant	730 81
University hall, north wing	52,243 80
Agricultural engineering building	34,230 82
Agronomy building	28,905 87
J. J. Hill railway library fund	1,489 85
Students fees, refunded	2,328 60
Trostel prize fund	80 00
Vogel fellowship	280 00
North wing equipment	9,691 99
University grounds	36,318 11
F. W. Allis scholarship	200 00
Henry Gund scholarship	250 00
Gustave Kletzsch fellowship fund	23 00
Piano account	396 75
Agricultural Engineering building, equipment	9 68
Agronomy building, equipment	10 85
Steensland prize fund	70 00
Cream City prize fund	100 00
Total for year	$1,124,578 69

DETAIL OF DISBURSEMENTS, FOR FISCAL YEAR ENDING JUNE 30, 1908.

AGRICULTURAL COLLEGE AND EXPERIMENT STATION.

Salaries	$70,216 50	
Repairs and improvements	6,647 63	
Heat and water	10,025 00	
Insurance	857 40	
Postage and stationery	3,545 41	
Furniture	860 77	
Traveling expenses	1,493 87	
Clerks and stenographers	8,158 49	
Janitors	2,309 75	
Books and binding	1,053 83	
Roads and grounds	372 74	
Labor	15,840 41	
Seeds, plants and sundry supplies	5,378 87	
Tools, implements and machinery	2,513 51	
Feeding stuffs	7,216 88	
Scientific apparatus	717 50	
Live stock	1,917 60	
Chemical supplies	2,931 90	
Contingent expenses	376 56	
Freight and express	1,632 28	
Publications	744 89	
Fencing and drainage	878 36	
Dairy tests	3,968 45	
Inspection of feeding stuffs and fertilizers	1,363 55	
Agricultural institutes	17,444 00	
Milk	61,185 15	
Tobacco investigation	842 28	
Cranberry investigation	1,866 80	
Sub-stations	4,176 71	
Soils, investigation	3,229 10	
Butter scoring	910 05	
Horse pedigree	567 08	
Fertilizers	16 40	
Total		$240,759 40

COLLEGE OF LETTERS AND SCIENCE.

Salaries	$299,907 57	
Apparatus, general	3,404 53	
Repairs and improvements	6,237 96	
Heat and water	22,005 55	
Insurance	1,658 14	
Light	4,918 58	
Postage and stationery	1,130 00	
Printing and publications	496 20	
Furniture	1,918 13	
Clerks and stenographers	4,948 20	
Janitors	7,297 87	
Incidentals	60 23	
Summer session	9,503 81	
Physics apparatus	420 05	
Botany apparatus	431 10	
Chemical apparatus	1,126 90	
Geology apparatus	1,053 65	
Zoology apparatus	427 55	
Psychology apparatus	318 66	
Bacteriology apparatus	191 02	
Anatomical apparatus	954 59	
Pharmacy apparatus	192 39	
Erlanger apparatus	1,808 54	
Home economics apparatus	412 85	
Education apparatus	351 26	
Anthropology apparatus	197 64	
Research, Burchell	498 94	
Home economics, housekeepers convention	131 21	

Home economics, incidentals	118 68	
Emeritus professors	6,045 00	
Dean's contingent	384 11	
Training of teachers	1,451 28	
Lecturer	831 71	
Hygienic	1,633 60	
Photographic apparatus	45	
Total		$382,462 90

COLLEGE OF ENGINEERING.

Salaries	$78,668 48	
Apparatus, general	19,675 93	
Repairs and improvements	1,721 99	
Heat and water	11,340 63	
Insurance	621 80	
Light	1,520 61	
Postage and stationery	365 38	
Printing and publication	304 25	
Furniture	1,080 43	
Traveling expenses	1,107 23	
Clerks and stenographers	1,245 00	
Janitors	4,279 [illegible]	
Incidentals	205 [illegible]	
Research fund	[illegible]	
School for artisans	3,150 00	
Hydraulic laboratory building	10 35	
Repairs, chemistry building	9 [illegible]	
School of surveying	400 00	
Total		[illegible]

ADMINISTRATION.

Heat and water	$500 [illegible]	
Light	[illegible]	
Postage and stationery	[illegible]	
Janitors	[illegible]	
Incidentals	[illegible]	
Expenses of regents	[illegible]	
Expenses of visitors	[illegible]	
President's contingent	[illegible]	
President's office, salaries	[illegible]	
President's clerks and stenographers	[illegible]	
Registrar's office, salaries	[illegible]	
Registrar's clerks and stenographers	[illegible]	
Registrar's assistants	[illegible]	
Registrar's assistants, $600	[illegible]	
Registrar's office, postage and stationery	[illegible]	
Regents' office, salaries	[illegible]	
Regents' clerks and stenographers	[illegible]	
Regents' office, postage and stationery	[illegible]	
Total		[illegible]

LABORATORY SUPPLIES.

Chemical laboratory supplies	[illegible]	
Botanical laboratory supplies	[illegible]	
Bacteriology laboratory supplies	[illegible]	
Engineering laboratory supplies	[illegible]	
Psychology laboratory supplies	[illegible]	
Mineralogy laboratory supplies	[illegible]	
Geological laboratory supplies	[illegible]	
Anatomical laboratory supplies	[illegible]	
Home laboratory supplies	[illegible]	
Business laboratory supplies	[illegible]	
Erlanger laboratory supplies	[illegible]	
Correspondence laboratory supplies	[illegible]	
Zoology laboratory supplies	[illegible]	
Physics laboratory supplies	[illegible]	
Lecture laboratory supplies	[illegible]	
Total		[illegible]

COLLEGE OF LAW.

Salaries	$16,849 92	
Repairs and improvements	485 25	
Heat and water	1,481 76	
Insurance	207 27	
Light	266 14	
Postage and stationery	137 94	
Printing and advertising	51 86	
Traveling expenses	79 12	
Clerks and stenographers	722 70	
Janitors	601 66	
Summer session	1,075 00	
Books and binding	2,763 46	
Total		$24,722 08

PHYSICAL CULTURE, MEN.

Salaries	$8,650 00	
Apparatus, general	78 65	
Repairs and improvements	898 83	
Heat and water	6,938 52	
Insurance	331 68	
Light	495 83	
Postage and stationery	78 05	
Clerks and stenographers	604 80	
Janitors	1,222 00	
Athletics	9 00	
Incidentals	1,037 10	
Total		$20,343 90

PHYSICAL CULTURE, WOMEN.

Salaries	$3,300 00	
Apparatus, general	259 25	
Repairs and improvements	12 00	
Postage and stationery	1 10	
Furniture	79 37	
Janitors	5 10	
Incidentals	187 93	
Total		$3,844 75

GENERAL ACCOUNT.

Salaries	$1,899 96	
Repairs and improvements	3,008 66	
Postage and stationery	469 84	
Printing and advertising	12,022 02	
Furniture	730 18	
Clerks and stenographers	2,062 65	
Janitors	1,553 65	
Incidentals	2,354 98	
Interest	2,804 23	
Roads and grounds	6,634 96	
High school inspection	1,058 70	
Maintenance president's house	856 87	
Commencement, etc.	1,002 92	
Photographic apparatus	497 98	
Graduate department	793 04	
Team and labor	2,029 95	
Dray	987 35	
Telephones	2,912 62	
Laird account, etc.	2,276 89	
Total		$45,957 45

WASHBURN OBSERVATORY.

Salaries	$5,000 00	
Apparatus, general	8 77	
Repairs and improvements	188 00	

Home economics, incidentals	118 68	....
Emeritus professors	6,045 00	....
Dean's contingent	384 11	....
Training of teachers	1,451 28	....
Lecturer	831 71	....
Hygienic	1,633 60	....
Photographic apparatus	45	....
Total		$382,402 90

COLLEGE OF ENGINEERING.

Salaries	$78,602 48	....
Apparatus, general	19,675 93	....
Repairs and improvements	1,721 99	....
Heat and water	11,340 63	....
Insurance	621 80	....
Light	1,520 61	....
Postage and stationery	365 88	....
Printing and publication	804 25	....
Furniture	1,080 43	....
Traveling expenses	1,107 23	....
Clerks and stenographers	1,245 00	....
Janitors	4,279 91	....
Incidentals	205 46	....
Research fund	4,311 39	....
School for artisans	3,150 00	....
Hydraulic laboratory building	10 35	....
Repairs, chemistry building	9 86	....
School of surveying	400 00	....
Total		$130,012 70

ADMINISTRATION.

Heat and water	$500 58	....
Light	102 02	....
Postage and stationery	69 47	....
Janitors	71 76	....
Incidentals	126 08	....
Expenses of regents	872 49	....
Expenses of visitors	257 56	....
President's contingent	1,234 80	....
President's office, salaries	7,491 63	....
President's clerks and stenographers	146 50	....
Registrar's office, salaries	2,391 66	....
Registrar's clerks and stenographers	2,301 05	....
Registrar's assistants	481 20	....
Registrar's assistants, $600	101 90	....
Registrar's office, postage and stationery	1,729 90	....
Regents' office, salaries	4,795 00	....
Regents' clerks and stenographers	6,140 59	....
Regents' office, postage and stationery	1,157 10	....
Total		$29,971 28

LABORATORY SUPPLIES.

Chemical laboratory supplies	$13,998 96	....
Botanical laboratory supplies	1,105 63	....
Bacteriology laboratory supplies	361 82	....
Engineering laboratory supplies	9,912 77	....
Psychology laboratory supplies	39 50	....
Mineralogy laboratory supplies	228 38	....
Geological laboratory supplies	110 82	....
Anatomical laboratory supplies	920 46	....
Home laboratory supplies	176 38	....
Business laboratory, supplies	158 31	....
Erlanger laboratory supplies	135 59	....
Correspondence laboratory supplies	1,084 25	....
Zoology laboratory supplies	129 35	....
Physics laboratory supplies	4,091 77	....
Lecture laboratory supplies	211 58	....
Total		$32,665 57

COLLEGE OF LAW.

Salaries	$16,849 92	
Repairs and improvements	485 25	
Heat and water	1,481 76	
Insurance	207 27	
Light	266 14	
Postage and stationery	137 94	
Printing and advertising	51 86	
Traveling expenses	79 12	
Clerks and stenographers	722 70	
Janitors	601 66	
Summer session	1,075 00	
Books and binding	2,763 46	
Total		$24,722 08

PHYSICAL CULTURE, MEN.

Salaries	$8,650 00	
Apparatus, general	78 65	
Repairs and improvements	898 83	
Heat and water	6,938 52	
Insurance	331 63	
Light	495 33	
Postage and stationery	78 05	
Clerks and stenographers	604 80	
Janitors	1,222 00	
Athletics	9 00	
Incidentals	1,037 10	
Total		$20,343 90

PHYSICAL CULTURE, WOMEN.

Salaries	$3,300 00	
Apparatus, general	259 25	
Repairs and improvements	12 00	
Postage and stationery	1 10	
Furniture	79 37	
Janitors	5 10	
Incidentals	187 98	
Total		$3,844 75

GENERAL ACCOUNT.

Salaries	$1,809 96	
Repairs and improvements	3,008 66	
Postage and stationery	469 84	
Printing and advertising	12,022 02	
Furniture	730 18	
Clerks and stenographers	2,062 65	
Janitors	1,553 65	
Incidentals	2,354 98	
Interest	2,804 23	
Roads and grounds	6,634 96	
High school inspection	1,058 70	
Maintenance president's house	856 87	
Commencement, etc.	1,002 92	
Photographic apparatus	497 98	
Graduate department	793 04	
Team and labor	2,029 95	
Dray	987 85	
Telephones	2,912 62	
Laird account, etc.	2,276 89	
Total		$45,957 45

WASHBURN OBSERVATORY.

Salaries	$5,000 00	
Apparatus, general	8 77	
Repairs and improvements	188 00	

Heat and water	208 75	
Insurance	165 82	
Light	13 75	
Postage and stationery	46 20	
Clerks and stenographers	487 99	
Janitors	595 00	
Incidentals	214 21	
Total		$6,928 49

CHADBOURNE HALL.

Salaries	$1,300 00	
Repairs and improvements	1,489 84	
Heat and water	3,557 41	
Insurance	331 62	
Light	2,209 46	
Postage and stationery	2 00	
Furniture	255 75	
Janitors	2,020 38	
Incidentals	14 47	
Total		$11,180 93

GENERAL LIBRARY.

Salaries	$15,735 43	
Heat and water	5,418 54	
Light	1,384 41	
Postage and stationery	308 50	
Books and binding	20,340,03	
Maintenance, library building	371 96	
Total		$43,558 67

MILITARY DEPARTMENT.

Salaries	$90 00	
Repairs and improvements	58 85	
Postage and stationery	57 19	
Clerks and stenographers	88 50	
Incidentals	1,117 80	
Band	541 95	
Commutation of quarters	288 00	
Fees refunded	320 00	
Field officers' prizes	150 00	
Total		$2,706 79

UNIVERSITY EXTENSION.

Salaries	$9,577 50	
Postage and stationery	1,797 79	
Printing and advertising	2,443 06	
Furniture	739 98	
Traveling expenses	1,045 93	
Clerks and stenographers	2,254 40	
Incidentals	773 25	
Freight and express	42 83	
Total		$18,076 [illegible]

ARCHITECT'S OFFICE.

Salaries	$3,032 50	
Postage and stationery	188 80	
Clerks and stenographers	595 00	
Incidentals	148 52	
Total		$3,964 [illegible]

Fees refunded	$1,998 85
University grounds	3,401 75
Piano account	1,198 14
J. J. Hill railway library fund	1,526 46
Women's building	2,112 89
Tunnels	231 87
New central heating plant	46,650 21
Addition to administration building	9,900 86
Store room	1,700 59
Agricultural engineering building	9,184 42
Agronomy building	5,848 82
Agricultural engineering building equipment	4,540 57
Agronomy building equipment	8,066 10
Trostel prize fund	250 00
North wing equipment	658 08
Gustave Kletzsch fellowship fund	3 71
Henry Gund scholarship	25 00
F. W. Allis scholarship	150 00
Henry Wergeland scholarship	200 00
Animal husbandry building	610 29
Equipment administration building	591 75
Total	$1,091,584 62
Less store room credit	449 25
	$1,091,185 87

RECAPITULATION OF EXPENDITURES BY SUB-ACCOUNTS FOR THE YEAR ENDING JUNE 30, 1908.

Salaries	$514,221 95
Apparatus	23,427 18
Repairs and improvements	20,744 01
Heat and water	61,476 74
Insurance	4,178 67
Light	10,910 80
Postage and stationery	8,192 67
Printing and publications	15,817 39
Furniture	5,659 55
Traveling expenses	3,726 15
Clerks and stenographers	21,167 73
Janitors	19,967 08
Incidentals	6,239 58
Summer session	10,578 81
Books and binding	24,157 32
Snow apparatus	420 05
Botany apparatus	431 10
Chemical apparatus	1,126 90
Geology apparatus	1,053 65
Zoology apparatus	427 55
Psychology apparatus	318 66
Bacteriology apparatus	191 02
Anatomical apparatus	954 59
Pharmacy apparatus	192 39
Erlanger apparatus	1,808 54
Home economics apparatus	412 85
Education apparatus	351 26
Anthropology apparatus	197 64
Research apparatus, Burchell	496 94
Home economics, housekeepers' convention	131 21
Home economics, incidentals	118 63
Emeritus professors	6,045 00
Dean's contingent, letters and science	384 11
Training of teachers	1,451 28
Lecturers	831 71
Museum, etc.	....
Hygienic	1,633 60
Research fund	4,311 39
School for artisans	3,150 00
Hydraulic laboratory building	10 35
Repairs old chemical building	9 36
School of surveying	400 00
Expenses of regents	872 49

Expenses of visitors	257	56
President's contingent	1,234	89
President's office, salaries	7,491	63
President's office, clerks and stenographers	146	50
Registrar's office, salaries	2,391	66
Registrar's office, clerks and stenographers	2,301	05
Registrar's assistants	431	20
Registrar's assistants, additional	101	90
Registrar's office, postage and stationery	1,729	90
Regent's office, salaries	4,795	00
Regent's office, clerks and stenographers	6,140	59
Regent's office, postage and stationery	1,157	10
Chemical laboratory supplies	13,998	06
Botany laboratory supplies	1,108	63
Bacteriology laboratory, supplies	361	82
Engineering laboratory supplies	9,912	77
Psychology laboratory supplies	39	50
Mineralogy laboratory supplies	228	38
Geology laboratory supplies	110	82
Anatomical laboratory supplies	920	46
Home laboratory supplies	176	38
Business laboratory supplies	158	31
Erlanger laboratory supplies	139	59
Correspondence laboratory supplies	1,085	25
Zoology laboratory supplies	129	35
Athletics	9	00
Interest	2,804	23
Roads and grounds	7,007	70
High school inspection	1,058	70
Maintenance president's house	856	87
Commencement, etc.	1,002	92
Photographic apparatus	498	43
Graduate department	793	04
Team and labor	2,029	95
Dray	987	35
Telephones	2,912	62
Laird & Cret account	2,276	89
One-half maintenance library building	371	76
Military band	541	95
Commutation of quarters	288	00
Labor	15,840	41
Seeds, plants and sundry supplies	5,378	87
Tools, implements and machinery	2,513	51
Feeding stuffs	7,216	88
Scientific apparatus	717	50
Live stock	1,917	60
Chemical supplies	2,931	90
Contingent expenses	376	56
Freight and express	1,675	11
Publications	744	29
Fencing and drainage	378	26
Dairy tests	3,968	45
Inspection feeding stuffs and fertilizers	1,363	55
Agricultural institutes	17,444	00
Milk	61,185	15
Tobacco investigation	842	28
Cranberry investigation	1,866	80
Northern sub-stations	4,178	71
Soils, investigations	3,229	19
Butter scoring	910	05
Horse pedigree	567	08
Fertilizers	16	40
Snow laboratory supplies	4,091	77
Lecture laboratory supplies	211	58
Fees, refunded, military department	320	00
Field officers' prizes	150	00
Fees refunded, general	1,998	85
University grounds	3,401	75
Piano account	1,193	14
J. J. Hill railway library fund	1,526	46
Women's building	2,112	29
Tunnels	231	87
New central heating plant	46,650	21
Addition, administration building	9,900	86
Store room, supplies	1,700	89
Agricultural engineering building	9,184	42
Agronomy building	5,848	82
Agricultural engineering building equipment	4,540	57
Agronomy building equipment	8,066	10
Trostel prize fund	250	00

North wing equipment	653 08
Gustave Kietzsch fellowship fund	3 71
Henry Gund scholarship	25 00
F. W. Allis scholarship	150 00
Henry Wergeland scholarship	200 00
Animal husbandry building	610 29
Equipment administration building	591 75
Total	$1,091,584 62
Less store room credits	449 25
	$1,091,135 37

STATEMENT OF ASSETS AND LIABILITIES AS OF JUNE 30, 1908.

Assets.			
Grounds		$307,350 04	
Buildings and tunnels		1,828,492 52	
Total		$2,135,842 56	
Library		$291,600 22	
Apparatus		384,157 70	
Furniture		105,097 24	
Machinery and tools		18,626 83	
Live stock		26,597 00	
Merchandise in store room		1,484 19	
Laboratory supplies		3,842 07	
Gund scholarship		25 00	
State treasurer		99,974 86	
Liabilities.			
Bills payable			$29,000 00
Sundry accounts:			
College of agriculture	$34,633 71		
Washburn observatory	6,449 38		
General library	4,556 72		
University extension	6,382 75		
Piano account	441 52		
Biological laboratory fund	116 18		
School of economics library fund	217 58		
Johnson endowment fund income	39 50		
Bryan prize fund income	37 50		
Jas. J. Hill railway library fund	2,634 16		
Halle Steensland prize fund	60 00		
Political science research fund	50 00		
Gustave A Kietzsch fellowship	252 08		
B. F. McMillan scholarship	50 00		55,921 08
State university capital account			2,981,826 59
Total		$3,066,747 67	$3,066,747 67

UNIVERSITY TRUST FUNDS.

(Under Regents' Law, June 1, 1906 all Bequests and Funds, the amount of which was to be used for specific purposes were set apart from all other University moneys and placed with the State Treasurer as custodian.)

The principal of the funds July 1, 1906, was	$72,800 44	
The Jas. T. Lewis prize fund		$400 00
The John A. Johnson student aid fund		6,899 76
The Mortimer M. Jackson law professorship fund		20,000 00
The Amelia E. H. Doyon student aid fund		5,000 00
The W. J. Bryan prize fund income		250 00
The Christian R. Stein student aid fund		1,000 00
The C. K. & Mary M. Adams' fellowship fund		24,000 68
The Mary M. Adams graduate fellowship No. 1 fund		10,000 00
The Milwaukee Gas Light Co. fund		250 00
The Henry Gund scholarship in German literature fund		5,000 00
	$72,800 44	$72,800 44
The income of the funds for the year 1906-1907 was	$3,184 07	
The Jas. T. Lewis prize fund income		17 50
The John A. Johnson student aid fund income		301 77
The M. M. Jackson law professorship fund income		874 74
The Amelia E. H. Doyan student aid fund income		218 69
The W. J. Bryan prize fund income		10 94
The Christian R. Stein student aid fund income		43 74
The C. K. & Mary M. Adams fellowship fund income		1,049 69
The Mary M. Adams graduate fellowship in English language and literature No. 1, income		437 37
The Milwaukee Gas Light fund income		10 94
The Henry Gund scholarship in German literature fund income		218 69
	$3,184 07	$3,184 07
The principal of the funds July 1, 1907, was	$82,839 51	
The Jas. T. Lewis prize fund		$400 00
The John A. Johnson student aid fund		7,059 53
The Mortimer M. Jackson law professorship fund		20,000 00
The Amelia E. H. Doyon student aid fund		5,000 00
The W. J. Bryan prize fund		250 00
The Christian R. Stein student aid fund		1,000 00
The C. K. & Mary M. Adams fellowship fund		23,879 95
The Mary M. Adams graduate fellowshop in English language and literature fund		10,000 00
The Milwaukee Gas Light Co. fund		250 00
The Henry Gund scholarship in German literature fund		5,000 00
The Fannie P. Lewis scholarship fund		10,000 00
The secretary's loan fund		50 00
	$82,889 51	$82,889 51
The income of the funds for the year 1907-1908 was	$4,013 80	
The Jas. T. Lewis prize fund income		$19 87
The John A. Johnson student aid fund income		341 84
The Mortimer M. Jackson law professorship fund income		968 47
The Amelia E. H. Doyon student aid fund income		242 12
The W. J. Bryan prize fund income		12 10
The Christian R. Stein student aid fund income		48 43
The C. K. and Mary M. Adams fellowship fund income		1,156 [illegible]
The Mary M. Adams graduate fellowship in English language and literature fund income		484 28
The Milwaukee Gas Light Co. fund income		12 10
The Henry Gund scholarship in German literature fund income		242 11
The Fannie P. Lewis scholarship fund income		484 28
The secretary's loan fund income		2 42
	$4,013 80	$4,013 80

UNIVERSITY TRUST FUNDS—continued.

The principal of the funds July 1, 1908	$83,851 46	
The Jas. T. Lewis prize fund		$400 00
The John A. Johnson student aid fund		7,714 96
The Mortimer M. Jackson law professorship fund		20,000 00
The Amelia E. H. Doyon student aid fund		5,000 00
The W. J. Bryan prize fund		250 00
The Christian R. Stein student aid fund		1,000 00
The Mary M. Adams graduate fellowship in English language and literature, No. 1, fund		10,000 00
The C. K. and Mary Adams fellowship fund		24,133 25
The Milwaukee Gas Light fund		250 00
The Henry Gund scholarship in German literature fund		5,000 00
The Fannie P. Lewis scholarship fund		10,000 00
The secretary's loan fund		103 25
	$83,851 46	$83,851 46

APPENDIX A

To the Report of the Regents of the University of Wisconsin,
Showing Detail of Disbursements of Funds for the
Two Years ending June 30, 1908

For further detail of pay roll items see Appendix B

DETAIL OF DISBURSEMENTS, 1906-1907.

COLLEGE OF AGRICULTURE

Henry, W. A., dean and director, salary	$4,000 00	
Otis, D. H., assistant to dean, and professor	2,500 00	
Moore, Jas. G., instructor, salary	850 00	
Babcock, S. M., professor, salary	3,000 00	
Hart, E. B., professor, salary	2,500 00	
Woll, F. W., professor, salary	2,500 00	
Olson, Geo. A., instructor, salary	1,200 00	
Tottingham, Wm. E., instructor, salary	900 00	
Whitson, A. R., professor, salary	2,500 00	
Stoddart, Chas. W., assistant professor, salary	1,400 00	
Jones, E. R., instructor, salary	900 00	
Humphrey, Geo. C., professor, salary	2,100 00	
Fuller, Jas. G., instructor, salary	1,000 00	
Kleinheinz, F., instructor, salary	1,200 00	
Alexander, A. S., professor, salary	2,500 00	
Sandsten, E. P., professor, salary	2,500 00	
Russell, H. L., professor, salary	2,500 00	
Hastings, E. G., assistant professor, salary	1,500 00	
Hoffman, Conrad, assistant, salary	720 00	
Farrington, E. H., professor, salary	2,700 00	
Benkendorf, G. H., instructor, salary	1,200 00	
Meyer, Martin H., instructor, salary	1,000 00	
Moore, R. A., professor, salary	2,300 00	
Stone, A. L., instructor, salary	480 00	
Ocock, Chas. A., instructor, salary	1,200 00	
Knapp, G. N., instructor, salary	600 00	
Milward, James, assistant, salary	600 00	
Harris, Roy T., instructor, salary	210 00	
Schroeder, Chris., instructor, salary	498 00	
Rogers, A. J., Jr., instructor, salary	72 00	
Anderson, A. L., board	4.75	
American Southdown Breeders' Association, fees	13 00	
Andrews, J. M., bills paid	43 59	
American Tamworth Swine Association, pedigree	7 00	
American Jersey Cattle Club, registry book	1 00	
Angell, Geo. R., & Co., directories	8 00	
Andrews, A. H., & Co., furniture	40 50	
Association of American Agricultural Colleges, fee	30 00	
Aspinwall Mfg. Co., potato planter	44 00	
American Poland-China Record Association, pedigree	9 00	
Ayer, H. D., photo work	7 00	
American Berkshire Assoc., entry fees	7 50	
American Yorkshire Club, certificates	6 00	
American Aberdeen-Angus Asso., certificates	5 00	
Accola, John, expenses	11 12	
American Shropshire Registry Assoc., registration	14 75	
Alford Bros., laundry work	25 80	
Agricultural College pay roll, labor, etc	32,055 08	
Adm. pay roll, clerks, etc	1,818 25	
American Guernsey Cattle Club, registry fee, etc	46 00	
American Express Co., express	185 27	
Alexander, A. S., expenses	171 09	
American Cheviot Sheep Society, book, registration	6 00	
Armour Fertilizer Works, fertilizers	101 78	
American-Duroc Jersey Association, book	17 00	
American Shorthorn Breeders' Assoc., registration, books	9 50	
Agricultural Institute pay roll, salaries	2,096 00	
Bischoff & Co., C., chemicals	7 00	
Bigelow, Ray, expenses	3 40	
Bunker, F. S., condition powder	1 60	
Barrett & Co., G. M., mdse	12 47	
Brittingham & Hixon, lumber	6 24	
Brillion Iron Works, freight paid	2 36	
Beal, M. J., custodian, book	1 09	

Baldwin, O. A. E., plants	23 80	
Bingham Hardware Co., hardware	7 75	
Burnett, C. W., potatoes	1 20	
Budd, W. W., digging trench	52 50	
Bell & Zoller Co., coal	38	
Burdick & Murray Co., ribbon	3 80	
Broughton, Arthur, lambs	80 00	
Burroughs Adding Machine Co., paper	4 25	
Brown Swiss Catttle Breeders' Assoc., registration	2 00	
Bloomer Produce Co., hay	102 60	
Birdsell Mfg. Co., clover huller	457 20	
Barber Creamery Supply Co., thermometers, etc	135 50	
Brockhaus, F. A., books	244 85	
Booth & Co., A., butter and storage	84 72	
Belle City Mfg. Co., thresher, machinery	199 00	
Babbitt, B. T., potash, lye	32 00	
Burger, Peter, hardware	223 53	
Burwell & Co., apparatus	231 19	
Bausch & Lomb Opt. Co., chemicals, etc	911 90	
Blied & Schneider, hardware	128 20	
Benkendorf, G. H., expenses	190 72	
Bischoff, George L., plastering	233 40	
Buffalo Scale Co., scale	43 70	
Centralia Hardware Co., hardware	24 31	
Campbell, J., ram	60 00	
Commercial Press Co., periodicals	8 75	
Cutaway Harrow Co., grass hoe	7 00	
Chaplin, H. A., cheese	272 60	
Chicago Flexible Shaft Co., cogs	2 60	
Corn Products Mfg. Co., feed	45 00	
Carman, Charles, horseshoeing	31 10	
Chandler, S. S., potatoes	60 84	
Calkins, E. M., tobacco seed	90 00	
Cutler-Hammer Mfg. Co., starter	3 30	
Copps Bros., tobacco shed	871 50	
Cooledge, J. H., corn	9 00	
Case, E. C., books	1 00	
Centralia Waterpower Co., canvas	5 46	
Capital City Fuel Co., ice	50 00	
Cranmoor Telephone Co., rentals	18 25	
Chicago Rawhide Mfg. Co., pinion	3 75	
College Book Store, stationery	1 80	
Clipper Lawn Mower Co., mower	5 50	
Cabot, Godfrey L., carbon paper	2 00	
Chicago Envelope Co., envelopes	162 60	
Carterville Washed Coal Co., coal	7 58	
Cornish, Curtis & Greene Mfg. Co., tubes	29 95	
C. & N. W. Ry. Co., freight	1,031 83	
City of Madison, water	19 54	
Currie Bros., seeds	91 66	
Carter-Crume Co., records, mdse, stationery	40 35	
Clark Engraving Co., engravings	178 19	
Conklin & Sons, ice, cement, lime	529 49	
Creamery Pay Roll, milk	44,492 39	
Cantwell Printing Co., printing	753 38	
Capital City Paper Co., paper, twine	83 48	
Crane Co., pipe and fittings	250 42	
Creamery Package Mfg. Co., butter tubs, apparatus, etc.	793 53	
Cooley, C. F., cement, coal	5,509 05	
Coe, Converse & Edwards Co., trees	22 94	
Cook & Brown Lime Co., lime and tile	110 87	
C., M. & St. P. Ry. Co., freight	734 55	
Door County Fruit Nurseries, apples	2 00	
Deming Co., The, apparatus	1 58	
Davis Bros. Cheese Co., cheese	95 20	
Dann, F. M., use of gate	5 00	
Danielson & Husebo, parchment paper	2 60	
Drew, L. S., refund license fee	2 00	
Danks, J. R., ear markers	15 00	
Dopp & Watson, barbed wire	24 23	
Downing's Nursery, plants	2 00	
Daly, John E., blue vitriol	33 45	
Diamond Crystal Salt Co., butter salt	12 50	
Dairy Instructors' Roll, instruction	4,368 08	
DeLong, H. S., agent, freight	6 00	
Dennison Mfg. Co., tags and seals	7 00	
DeLaval Separator Co., pulleys, tools	8 12	
Dengler, C. M., lettering	7 33	
Dickinson Co., Albert, seeds	123 13	

Diederich, M., mdse	16 48	
Douglas County Poor Farm, labor	212 35	
Dane County Telephone Co., rentals	217 12	
Diepold, P. J., blacksmithing	125 05	
Delwiche, E. J., expenses	586 70	
Doyon & Rayne Lumber Co., lumber	316 69	
DesRivieres Co., Geo. R., baled shavings	150 08	
Deane Steam Pump Co., valves, extras	17 58	
Democrat Printing Co., printing	4,164 43	
Electrical Supply Co., mdse	36 34	
Eastman, J. S., electric mdse	39 85	
Ender Coal Co., coal	12 58	
Elliott Co., The, addressing machine, supplies	572 75	
Eimer & Amend, chemicals	27 35	
Ellwanger & Barry, pear roots	2 00	
Esser, Mrs. L., silk	1 50	
Ewer, H. D., cultivator	9 28	
Evening Wisconsin Co., printing	50 00	
Eastman, S. A., expenses	20 50	
Findlay & Co., salt	14 15	
Fargo, F. B., expenses	3 56	
Flint, Robert, sows	120 00	
Frauenheim, O. R., seed corn	18 00	
Ferguson Bros., blue vitriol	172 92	
Felton, A. P., keys, etc	1 25	
Findorf, J. H., lumber	1 25	
Fair Store, fruit jars, blankets	15 11	
Fairchild & Bro., M. H., dairy powder	67 21	
Fargo Creamery Supply House, repairs, tester	41 18	
Field Force Pump Co., nozzles, repairs	24 20	
Frederickson, A. D. & J. V., lumber	465 53	
Ford Co., J. B., cleaner, soda	9 27	
Foley Mfg. Co., plant boxes, sky lights	64 40	
Fuller, Jas. G., expenses	90 08	
Gould Co., The, strainers	2 30	
Greening Bros. Nursery Co., trees	4 68	
Gugel & Frisch, threshing and sawing wood	6 60	
Gennert G., camera, etc	65 63	
Garling & Son, C., cheese	37 87	
Gordon, Jos., boar	50 50	
Gaynor Cranberry Co	15 28	
Gallagher Co., John, awnings, etc	8 00	
Gund Brewing Co., John, grain	46 50	
Guger, Wm., straw	4 00	
Gimbel Bros., cork carpet	125 00	
Goulds Mfg. Co., nozzles	19 25	
Gurley, W. & L. E., repairing meter	7 00	
Gould, Wells & Blackburn Co., mdse	118 83	
Grimm's Bindery, binding	134 60	
Green, Henry J., psychrometer	9 50	
Holstein-Fresian Association, registration	10 25	
Hahn, A. W., cheese	18 40	
Hoffmann, Mrs. John, mending sacks	1 50	
Horstmeyer, H. C., plumbing	41 01	
Hoeveler, Theo., upholstering	3 00	
Harloff, P. F., elec. mdse	46 76	
Hartley, Wm., steer	100 00	
Hunter, John, sheep	60 00	
Hinkley, A. A., books	1 45	
Hays, Cushman, books, etc	50 00	
Houg, John, expenses	4 61	
Hooverson, John C., tobacco seed	125 00	
Harkins, L. P., cranberry vines	45 00	
Hyland, W. J., gas lamps	5 50	
Hatfield, Mrs., boarding men	12 25	
Hart, E. B., expenses	58 67	
Hillis, J. L. Treas., contribution	25 00	
Hoffman, C., expenses	2 30	
Hill Co., The E. G., plants	6 24	
Hirsch Bros., tools	13 00	
Houser, W. L., live stock	270 00	
Heddles, W. S., calf	15 00	
Herr Bros., cow	125 00	
Hafer & Sons Coal Co., coal	27 43	
Howe Scale Co., scale	20 65	
Huels, F. W., repairing, locks and keys	11 80	
Humphrey, Geo C., expenses	238 88	
Harris, Roy T., expenses	165 23	
Hunt, E. H., supplies	7 20	

Hartmeyer, J., butchering, express	18 00	
Hinrichs Dry Goods Co., mdse	16 45	
Haswell & Co., A., letter files, furniture	625 07	
Hollister Drug Co., drugs, etc	150 41	
Hoffman Feed Co., feed, shavings, etc	249 57	
Haak, Wm., Jr., pump repairs, engine, leather, etc	185 96	
Harris, Roy T., dairy tests	430 00	
Hardenberg, C. B., expenses, drawings	138 95	
Henry, W. A., expenses	138 25	
Hayes, John D., horseshoeing	90 65	
Heat, light and water percentages	416 80	
Hoffmann, Wm., oats	1,925 90	
International Harvester Co., spring tooth harrow, twine, repairs	32 55	
Illinois Elec. Co., mdse	44 52	
Illinois Central Ry. Co., freight, coal frt	181 16	
International Chemical Co., formaldehyde	3 81	
International Instrument Co., apparatus	54 75	
Ilgenfritz Sons Co., J. E., plants	8 40	
International Salt Co., salt	8 75	
Ingram-Richardson Mfg. Co., iron signs	25 75	
International Live Stock Exposition, stall rent	57 42	
International Stock Food Co., stock food	3 75	
Johnson & Hill Co., mdse.	32 72	
Jones, E. R., expenses	220 93	
Johns-Manville Co., H. W., covering	133 76	
Kronke Bros., hdwe.	96 19	
Kluter Bros., feed	652 94	
Kleinheinz, Frank, expenses, prize money	239 11	
King & Walker Co., castings, fittings	158 45	
Kimball Glass Co., bottles	17 35	
Keyes, Wm., hauling coal	23 73	
Kornhauser & Co., Alex., muslin	4 80	
Koch & Loeber Co., crates	18 00	
Keeley, Neckerman & Kessenich, mdse	3 40	
Kraft, George, plumbing	70 00	
King, F. H., calf	5 00	
Kellogg Bros. Lumber Co., lumber	14 00	
Klein Bros., paints	6 00	
Keuffel & Esser Co., apparatus	88 20	
Levitan, Sol., boxes	3 00	
Lottes, W. G., salary	1 60	
Lovejoy & Son, A. J., sows	150 00	
Lynch, Patrick, repairing harness	5 15	
Lydow, James, calves	12 00	
Leitz, Ernst, chemicals and apparatus	457 52	
Lake, D. S., seedling trees	38 35	
Lake's Sons Co., Henry, apple trees	5 25	
Loeb & McKay, printing	31 00	
Martin & Co., C. F., negatives	14 00	
Milwaukee Leather Belting Co., belting	45 35	
Milwaukee Bag Co., hay caps	25 50	
Middleton, W. E., leather case	3 25	
Madison Saddlery Co., repairing harness	8 46	
McIntosh Stereopticon Co., screen	9 60	
MacVeagh & Co., Franklin, rice	100 00	
McComb, C. J. expenses	6 01	
Madison Saddlery Co., harness, etc.	31 75	
Meyer, J. J., sawing wood	8 50	
Manda, W. A., plants	15 25	
McCray Refrigerator Co., refrigerator	49 18	
"Madisonian," The, printing	122 80	
McComb, C. J., expenses	15 42	
Meyer, John I., pump work	12 00	
Morris Printing Co., book	1 00	
Matson & Klein, shade cloth, etc.	3 78	
Marsh & Co., mdse.	5 60	
Milwaukee Bag Co., bags	21 00	
Melchoir, Armstrong & Dresen, rubber rings	1 52	
Mueller Co., The, pipe and fittings	391 58	
Meyer & Bro., F. E., pump	12 50	
Morrill & Morley, apparatus	3 28	
Metz, Anton, plumbing, hose	13 50	
Moore, J. W., expenses, cheese	633 10	
May & Co., L. L., seeds, plants, etc.	333 83	
Menges Pharmacy, drugs	65 80	
Moseley, James E., stationery	52 75	
Malde, O. G., expenses	278 71	
Madison Tent & Awning Co., wagon covers, awnings	62 70	
Marshall, R. R., expenses	248 66	

Milward, J. G., expenses	283 91	
McClurg & Co., books	206 92	
Madison Gas & Elec. Co., gas and current	2,139 60	
McCarthy, T. C., mason work	119 93	
Minch, H. J., feed	8 35	
Merrill Lumber Co., shavings	63 00	
Marschall Dairy Laby., extract, etc.	5 16	
McKerrow, George, Supt. Farmer's Inst., salary	2,200 00	
Mandel Engraving Co., half tones	5 95	
Meyer, Frank M., horseshoeing	75 60	
McLeod, A. F., salary	1,100 00	
McKerrow, Geo., expenses	2,310 46	
Moore, Jas. G., expenses, boxes	85 28	
Meier & Kelley, gasoline, mdse.	18 45	
Mautz Bros., paints	143 70	
Moore, R. A., expenses	184 41	
Mayers, A. A., mdse.	180 90	
Newbury & Peper, cells, belting	10 68	
Northern Elec'l. Mfg. Co., mdse.	7 50	
Neostyle Co., stencils and supplies	401 98	
National Distilling Co., alcohol	23 35	
Neilson, E. C., slides and photo work	374 59	
Nichols Co., The, hammers	1 20	
Nieman, Otto, ice	32 00	
Nelson, Martin, expenses	129 58	
Owens, Wm., plumbing	335 93	
Otis, D. H., expenses	83 20	
Olds Seed Co., L. L., peas, seeds	30 38	
Oppel's Grocery, berry boxes, milk, etc.	21 10	
O'Malley & Castle, barbed wire	10 00	
O'Gara Coal Co., coal	16 35	
Olson, Geo. A., expenses	2 11	
Ocock, C. A., expenses	62 07	
Parsons Printing & Sta. Co., printing and stationery	680 57	
Postmaster, Madison, postage	872 64	
Pettingill, J. A., dynamite, rent of land	109 05	
Pure Gluten Food Co., wheat gluten	190 00	
Pitman Dry Goods Co., mdse.	33 02	
Petrie, Elliott & Herrington, scraper, etc.	91 75	
Park & Saffle Co., stationery	208 43	
Pierstorff, Wm., oats, hay	159 93	
Piper Bros., sugar, etc.	4 90	
Pickarts, L. J., bursar, postage and contingent	1,336 02	
Post Publishing Co., printing	198 75	
Peacock, J. A., hay	98 32	
Paterson Parchment Paper Co., paper	89 00	
Pieh, J. F., sand	5 00	
Parke, Davis & Co., flavorone	2 00	
Pecher, F. J., suits, etc.	13 00	
Poultry Pub. Co., book	4 00	
Proctor, J. C., agent, insurance	28 33	
Ploeckelman, Wm., labor and material	345 00	
Paper Mills Co., typewriter paper	7 00	
Parkinson-Marling Co., lumber	82 31	
Phillips, J. D., engrossing	28 80	
Pataska, Martin, bookcase	9 75	
Percheron Society of America, book	5 00	
Pioneer Publishing Co., printing	9 55	
Phillips, A. J., book	1 00	
Queen & Co., apparatus	21 66	
Quaker Oats Co., avena	50 00	
Reed Mfg. Co., axle plates	27 00	
Rowell & Co., I. B., beet lifter	6 00	
Rand, McNally & Co., atlas	10 50	
Riverside Printing Co., printing	284 35	
Reis, A. C., cheese	27 04	
Rogerson Hdwe. Co., lime	6 30	
Red Polled Cattle Club, registration	4 25	
Ried, Wm., use of bull	15 00	
Rowlands, A. W., expenses	6 20	
Ryerson & Son, Jos., tubs	40 73	
Rock Co. Sugar Co., sugar beet pulp	43 50	
Remington Typewriter Co., supplies	6 11	
Randolph Paper Box Co., sample boxes	10 50	
Riverside Printing Co., printing	493 85	
Riley, E. F., Secretary, bills paid	7 74	
Russell, H. L., expenses	57 41	
Randall Bros., refund on deposit, sow	57 61	
Rogers, Jr., A. J., expenses, salary	145 30	
Stark Bros. Nurseries, trees and plants	3 18	

Sears-Roebuck Co., cooking utensils	19 80	
Sutter, Jos., plumbing	18 03	
Steckbauer, R. A., threshing	23 70	
Scientific Shop, apparatus	6 00	
Seyk & Co., cow peas	20 17	
Stonecipher, C. U., camera, etc.	30 00	
Small & Stevens, tape lines	20	
Sedgwick Machine Works, elevator	140 50	
Schroeder Bros., hay	26 55	
Straus, J. M., service of stallion	10 00	
Schmidt, Wm., repairing incubator	1 00	
Sykes, E., calf	8 00	
Schmidt, Wm., shears	1 10	
Sinaiko Bros., iron and lead	45 00	
Stubley, Fred, hay	2 25	
Schwoegler & Bliss, plumbing	23 40	
State Treasurer, insurance	761 08	
Swift & Co., fertilizer	129 93	
Schroeder, Chris., expenses	13 11	
State Horticultural Society, plants	15 00	
Smith & Co., N., plants	15 75	
Sechler Carriage Co., D. M., planter	27 00	
Stowell, L. D., cattle	450 00	
Stark, Frank, expenses	108 84	
Stephenson, David, crushed stone	146 02	
Stevenson & Studemann, hdwe.	57 50	
Stechert & Co., G. E., books	232 32	
Sandsten, E. P., expenses	253 28	
Stone, A. L., expenses	87 58	
Sunnyside Coal Co., coal	14 70	
Sandell, Harvey, expenses	52 04	
Standard Oil Co., oil waste, wax	54 58	
Schmidt, Wm., hdwe.	16 00	
Spencer Lens Co., instruments, apparatus	41 43	
Smith Premier Co., typewriter and supplies, etc	532 95	
Sumner & Morris, hdwe.	563 82	
State Journal Printing Co., printing	4 30	
Sargent & Co., E. H., chemicals, apparatus	1,805 47	
Smith, W. H., bills paid, rent of land	147 97	
Thomas Co., A. H., microscope, etc	136 80	
Thorburn & Co., J. M., seeds	53 13	
Toepfer, Otto, calves, sheep	74 30	
Tracy, Gibbs & Co., printing	99 90	
Torsion Balance Co., scales, etc.	113 55	
Taylor, H. C., sow	100 00	
Talmage's Sons Co., Dan, rice	130 00	
Tyler, Comfort A., Secy., registration	1 25	
Tyrrell, Jos, bookshelves	19 75	
Tower, O. R., lumber	8 07	
Taylor, Peter, manure	5 00	
Tobey, Chas. E., lime	6 00	
Thuerwachter, L., services	5 00	
Taylor & Gleason, printing	6 50	
Thatcher Mfg. Co., butter color, bottles	68 03	
University pay roll, labor, etc.	1,659 00	
United States Exp. Co., express	152 74	
University Co-op Co., stationery	208 17	
Vaughn & Sons, W. W., pig	25 00	
Vaas-Maw Dry Goods Co., mdse.	2 60	
Vaughan's Seed Store, seeds	41 05	
Van Ostrand, DeWitt, books, photos, express	14 72	
Valvoline Oil Co., oil	8 90	
Wagner Glass Works, bottles	42 00	
Whitson, A. R., expenses, bills paid	659 22	
Wells-Higman Co., baskets, hdwe.	30 08	
Wiedenbeck, Dobelin & Co., hdwe.	4 40	
Wehrmann, Charles, repairing harness	39 75	
Western Union Telegraph Co., messages	41 46	
Wolff, Kubly & Hirsig, hdwe.	93 66	
Wisconsin Telephone Co., rentals, message	8 45	
Washburn-Crosby Co., bran	727 50	
Whitall Tatum & Co., jars, vials, etc	68 71	
Warner, E. N., cows	25 00	
Worcester Salt Co., salt	7 65	
Wisconsin Music Co., violin strings	60	
Whiting Paper Co., paper	22 85	
Wisconsin Wagon Co., repairs, etc.	67 25	
Ward & Co., M., apparatus	55 10	
Wallace's Farmer, copies of paper	10 00	
Wright, Edgar, seed potatoes	4 50	

Walters, John, expenses	5 08	
Western Elec. Co., mdse.	10 20	
Watton Studio, photo plates	1 50	
Wrabetz, F., pigs	40 00	
Whelan, Dutee, calf	10 00	
Wood & Co., R. D., hydrants	25 90	
Wilcox & Co., W. W., tags	9 75	
West Side Lumber Co., lumber	9 94	
Whitman Agricultural Co., wine press	11 50	
Western Publishing House, books, etc.	12 50	
Woll, F. W., expenses	128 88	
Yahr & Lange Co., copper sulphate, blue vitriol	142 25	
Younker, J. H., posts	5 00	
Yawkey-Crowley Lbr. Co., lumber	426 18	
Zehnter Co., Julius, mdse.	3 39	
Zerbel, L. P. expenses	36 49	
Zenner Disinfectant Co., zenoleum	12 50	
Total		$197,314 65

COLLEGE OF LETTERS AND SCIENCE.

Administration pay roll, clerks, stenographers, etc.	2,902 00	
American Express Co., express	96 42	
Armstrong, V., chart work	9 00	
Allen, R. C., express	2 50	
Alford Bros., laundry	33 58	
Automatic File & Index Co., cases, guides, cabinets	35 51	
Anders, F. L., scholar	112 50	
Anglers Bait & Mfg. Co., The, terrapins	7 00	
Anderson, B. S., salary	3 95	
American Seating Co., chairs	93 00	
American Pharmaceutical Assoc., advertising	10 00	
American Radiator Co., radiators	32 90	
American Entomological Co., containers	169 50	
Andrews Co., A. H., chain	197 40	
Allen, Florence E., instructor, salary	1,000 00	
Allen, C. E., assistant professor, salary	1,500 00	
Allen, Ruth F., assistant, salary	250 00	
Allen, B. M., instructor, salary	1,250 00	
Ambler, C. H., fellow, salary	400 00	
Atwell, W. E., assistant, salary	220 00	
Adams, T. S., associate professor, salary	2,000 00	
Arzberger, E. G., assistant, salary	200 00	
Allen, Kathrine, instructor, salary	1,000 00	
Blied & Schneider, hdwe.	321 07	
Burroughs Adding Machine Co., adding machine	375 00	
Barnes Co., W. F. & J., lathe, etc.	93 31	
Baker, J. E., assistant, salary	330 00	
Bischoff, G. L., plastering	1,100 75	
Bishop & Co., J., condenser	210 35	
Bassett, V. H., specimens	25 00	
Burke & James, apparatus	9 61	
Bell & Zoller Co., coal	14 20	
Bausch & Lomb Optl. Co., labels, apparatus, etc	511 60	
Bartholomew, E., book	6 00	
Benner, R. C., instructor, salary	70 00	
Berger, Peter, hardware	8 85	
Brigham, A. P., expenses	8 83	
Ballard, Catherine, music	5 00	
Bryant & Co., C. A., advertising	7 20	
Butler, D. R., tunnel	519 00	
Benninghaven & Sommers, Dr., apparatus	181 96	
Bevier, I., expenses	18 64	
Barnes & Co., A. S., directories	7 50	
Boston Gear Works, brass, etc	8 60	
Brandel, C. O., map	1 00	
Blakiston's Sons & Co., P., book	2 50	
Bull, Storm, expenses	16 15	
Bloomfield, L., assistant, salary	400 00	
Birge, E. A., dean and professor, salary and expenses	4,612 28	
Brandt, J. G., assistant, salary	500 00	
Boardman, Eliot, assistant, salary	800 00	
Bode, B. H., assistant professor, salary	1,400 00	
Burchell, D. E., professor, salary and expenses	2,641 93	
Bleyer, W. G., assistant professor, salary	1,600 00	
Bridgman, B. W., assistant, salary	400 00	
Berkeley, F. C., instructor, salary	1,000 00	
Burrer, Karl O., assistant, salary	600 00	
Bardeen, C. R., professor, salary	3,300 00	

Blackman, J. R., assistant, salary	600 00	
Bredin, E. A., instructor, salary	1,000 00	
Brainard, F. K., assistant, salary	200 00	
Bailey, Wm. L., fellow, salary	400 00	
Blackwelder, E., assistant professor, salary	1,600 00	
Bartlett, J. L., assistant professor and observer, salary	200 00	
Burdick, L. W., fellow, salary	400 00	
Bradley, H. C., assistant professor, salary and supplies	1,418 41	
Bewick, T. L., assistant, salary	400 00	
Beatty, Arthur, instructor, salary	1,200 00	
Bashford, Erma M., instructor, salary	900 00	
Bruns, F., fellow, salary	417 00	
Crane Co., pipe and fittings	817 59	
C., M. & St. P. Ry. Co., freight	282 41	
Cooley, C. F., cement, coal, lime	2,122 70	
Conklin & Sons, ice, fuel, cement	1,734 90	
Capital City Paper Co., paper	7 95	
C. & N. W. Ry. Co., freight	194 07	
Clawson, A. B., assistant, salary	342 00	
Central Scientific Co., model, apparatus	25 50	
Collins, F. S., fascile	5 00	
Corey, G. W., assistant, salary	450 00	
Christman, A. H., fellow, salary	280 00	
Columbia Phonograph Co., transportation charges, knife	28 57	
Chamberlin, T. C., lectures	50 00	
Cling-Surface Co., belt filer	1 90	
Carterville Washed Coal Co., coal	280 58	
City of Madison, water	33 93	
Coulter, J. L., assistant, salary	200 00	
Crocker, W. G., advertising	5 00	
Curtiss, E. R., photos	1 50	
Catholic School Journal Co., advertising	19 50	
Chautauquan, The, advertising	10 57	
Conlin, D. F., draying	9 00	
Clark, W. B., maps	2 50	
Crawford, D. A., assistant, salary	140 00	
Chloride of Silver Dry Cell B. Co., battery	63 00	
Chicago Pulley & S. Co., belting	72 93	
Crowe, B. C., boarding, etc	33 57	
Crucible Steel Co., tool steel	1 58	
Cramton, B. L., typewriting	1 90	
Cox, G. H., student assistant, salary	60 00	
Chicago Projecting Co., The, cases, etc	2 48	
Cole, R. G., professor, expenses	12 00	
Cantwell Printing Co., printing	197 96	
Chicago School of Fireless Cooking, cooker	6 50	
Colburn, G. B., fellow, salary	400 00	
Cance, A. E., fellow	400 00	
Crafer, T. W. B., fellow, salary	400 00	
Campbell, Robert, assistant, salary	300 00	
Coffin, Victor, assistant professor, salary	2,000 00	
Cousins, G. V., assistant, salary	400 00	
Cooper, Elva, scholar, salary	225 00	
Conger, J. L., assistant, salary	440 00	
Cool, C. D., instructor, salary	800 00	
Cairns, W. B., assistant professor, salary	1,700 00	
Colton, A. L., instructor, salary	900 00	
Cook, E. A., instructor, salary	1,000 00	
Commons, J. R., professor, salary	1,000 00	
Deyrolle, Les Fils D'Emile, specimens	94 27	
DePere Tablet Co., blue books	68 30	
Davis Chair Co., chair	6 00	
Davis, L. L., lanterns, etc	178 22	
Dean, Alletta F., crockery, etc	61 95	
Darling, F. E., rabbits	5 50	
Dudley, W. H., lantern slides	334 70	
Democrat Printing Co., printing	175 70	
Dixon, F. H., salary	100 00	
Doyon & Rayne Lumber Co., lumber	117 85	
Dickerman, T., salary	130 00	
Dane County Telephone Co., rentals	80 65	
Dengler, C. M., lettering	22 38	
Dresen & Rhodes, shades	11 00	
Dearborn Drug & Chemical Works, compound	80 62	
Diederich, M., mdse	3 14	
Dreka Co., The, envelopes, stationery	23 75	
Dodge, R. E. N., assistant professor, salary	1,600 00	
Denniston, R. H., instructor, salary	1,205 19	
DuMez, A. G., assistant, salary	400 00	
Dowling, L. W., assistant professor, salary	2,000 00	

Doughty, H. W., instructor, salary	1,200 00	
Duval, E. P. R., instructor, salary	1,000 00	
Duncalf, Fred, scholar, salary	225 00	
Dilworth, J. F., salary	240 00	
Daniells, W. W., professor, salary	2,700 00	
Dickinson, T. H., instructor, salary	1,280 00	
Dearborn, W. F., instructor, salary	1,200 00	
Dennis, A. L. P., professor, salary	2,500 00	
Electrical Supply Co., electric supplies	655 23	
Eimer & Amend, chemicals, apparatus	1,164 02	
Electric Heat Regulator Co., regulators	27 00	
Ester Oyster Co., oysters	1 53	
Educator-Journal Co., advertising	15 00	
Educator School Supply Co., advertising	7 50	
Ender Coal Co., coal	465 49	
Elliott, E. C., associate professor, salary	2,283 90	
Ely, R. T., professor, salary	4,000 00	
Evans, M. B., assistant professor, salary	1,400 00	
Elston, T. S., salary	800 00	
Erlanger, Jos., professor, salary, bills paid	3,005 15	
Findlay & Co., groceries	3 32	
Field & Co., Marshall, toweling, etc	10 50	
Felton, A. P., locks, etc	16 30	
Findorff, J. H., contracts	920 72	
Friez, J. P., nephoscope	32 25	
Ferris & Ferris, drayage	2 00	
Fairbanks, H. W., slides	7 20	
Field, E. S., cards	43 95	
Frederickson, A. D. & J. V., lumber	4,242 78	
Foerst, J. P., mechanician, salary	1,200 00	
Ford, Amelia C., scholar, salary	225 00	
Freeman, J. C., professor, salary	600 00	
Fish, C. R., professor, salary	1,800 00	
Fiske, G. C., assistant professor, salary	1,800 00	
Freeman, J. C., professor, salary	3,000 00	
Fuller, C. A., instructor, salary	1,033 32	
Frost, W. D., assistant professor, salary	1,600 00	
Fischer, R., assistant professor, salary	700 00	
Fenneman, N. M., professor, salary	2,000 00	
Glen, Mary A., chart work	1 25	
Gillan & Co., S. Y., advertising	34 00	
Gilbert, E. M., salary	80 00	
Goebel, J. P., notes	2 00	
Geographic Society of Chicago, lantern slides	30 40	
Gardner Co., A. H., packing	28 60	
Gimbel Bros., tapestry, draperies	113 38	
Golsen, R. J., apparatus	27 50	
Gould, Wells & Blackburn Co., mdse	53 98	
Grant, U. S., expenses	13 30	
Grand Rapids Brass Co., holder	3 60	
Grimm's Bindery, binding	30 65	
Gray Herbarium, cards	133 91	
Gilman, S. W., instructor, salary	1,200 00	
Giese, W. F., associate professor, salary	2,000 00	
Gay, Lucy M., assistant professor, salary	1,500 00	
Gries, J. M., scholar, salary	225 00	
Grimes, N. C., instructor, salary	900 00	
Gage, Florence M., assistant, salary	300 00	
Hardy, Mrs. E. C., lecture	25 00	
Hardinge Bros., tools, etc	390 80	
Hoffman, Conrad, salary	40 00	
Holcomb Mfg. Co., J. I., brushes	12 50	
Harvard Apparatus Co., apparatus	319 45	
Heckemann, John, transportation charges	1 70	
Hoxie, R. F., expenses	16 95	
Hoffmann & Baur, piping, tin work	1,774 94	
Hastings, E. G., salary	40 00	
Hagerty, J. E., salary	75 00	
Harloff, P. F., electrical mdse	14 90	
Heil Chemical Co., H., chemicals, etc	72 69	
Hoetzsch, O. E. G., salary	75 00	
Haynes, Caroline C., book	1 50	
Hulburt & Co., M. A., oil	35 36	
Henderson-Yandell, apparatus	40 00	
Hobbs, Wm. H., rock collection	800 00	
Heckler, H., cases	54 00	
Harris & Co., Samuel, hardware, fittings, etc	8 53	
Hardy & Co., F. A., apparatus, etc	37 20	
Huels, F. W., repairing, etc	18 25	
Hollister Drug Co., drugs, etc	8 75	

Hafer & Son Coal Co., H., coal	1,016 22	
Haswell Furniture Co., furniture	250 15	
Hess, R. H., assistant, salary	500 00	
Hohlfeld, A. R., professor, salary	3,000 00	
Hall, C. H., assistant, salary	500 00	
Hicks, F. C., instructor, salary	1,000 00	
Haertel, M. H., instructor, salary	1,000 00	
Heat, Light and Water, percentages	12,830 14	
Hancock, G. D., scholar, salary	225 00	
Hitchcock, R. R., salary	400 00	
Haussmann, J. F., instructor, salary	1,020 00	
Huntington, Ellen A., instructor, salary	1,200 00	
Hunt, Caroline L., professor, salary	1,900 00	
Holmes, S. J., assistant professor, salary	1,600 00	
Hardenberg, C. B., fellow, salary	400 00	
Harper, R. A., professor, salary and expenses	3,008 60	
Hotchkiss, W. O., instructor, salary	890 00	
Hill, C. W., assistant, salary	400 00	
Hall, R. D., instructor, salary	1,000 00	
Hubbard, F. G., professor, salary	3,000 00	
Illinois Electric Co., mdse	119 44	
Inouye, N., salary	25 00	
Illinois Paper Box Co., boxes	3 96	
Illinois Central Ry. Co., freight, demurrage	6,000 58	
International Press Clipping Bureau, clipping service	55 00	
Ingersoll, L. R., instructor, salary	1,000 00	
Iles, I. V., assistant, salary	400 00	
Jaap, Otto, fungi	5 35	
Jenks, A. E., specimens	120 97	
Johnston, Mrs. M. F., lectures	57 21	
Johns-Manville Co., H. W., covering, etc	453 30	
Jenks, E. T., locks	3 50	
Jandus Elec. Co., arm for electric fan	3 33	
Johnson Service Co., heat regulation	150 00	
Johnson, A. S., lecturer	100 00	
Jenner, E. A., assistant, salary	400 00	
Johnson, A. R., assistant, salary	400 00	
Johnson, H. T., fellow, salary	400 00	
Jastrew, Jos., professor, salary	2,800 00	
Kornhauser & Co., A., mdse	17 78	
Keuffel & Esser Co., instruments, etc	46 00	
Keyes, Wm., hauling coal	989 10	
Kny-Scheerer Co., apparatus	236 55	
Klein Bros., paints, glass sign, etc	168 52	
Kroncke Bros., hardware	168 83	
Kimble Glass Co., vials	1 28	
Keller & Co., P., instruments	6 50	
Kohl, Max, apparatus	160 87	
King & Walker Co., castings, etc	35 69	
Kempf, J. J., treasurer, insurance premium	1,522 06	
Kaemfer, Fred., aquariums	67 50	
Kuehlemann, E., salary	150 00	
Krantz, Dr. F., specimens	42 01	
Kallen & Sons, M., brooms	9 00	
Knight, H. S., instructor, salary	1,000 00	
Kline, G. T., technician, salary	601 25	
Kind, J. L., instructor, salary	1,200 00	
Krauskopf, F. C., instructor, salary	800 00	
Koelker, W. F., instructor, salary	1,200 00	
Kahlenberg, L., professor, salary	2,800 00	
Kremers, Edw., professor and director	2,750 00	
Knowlton, P. A., scholar, salary	225 00	
Kelly, F. T., instructor, salary	1,200 00	
Kerr, Alexander, professor, salary	1,000 00	
Lorenz, E. H. J., mechanician, remodeling and expenses	78 50	
Lighty, Mrs. W. H., typewriting	14 75	
Library Bureau, binders, etc	12 00	
Lottes, W. G., salary	1 70	
Leeds & Northrup Co., The, bronze strips, etc	4 00	
Lydow, H., apparatus	8 15	
Leitz, Ernst, microscopic stands, etc	409 10	
Lathrop, H. B., associate professor, salary	1,140 00	
Laird, A. G., assistant professor, salary	2,000 00	
Lorenz, Max O., instructor, salary	1,400 00	
Lyman, R. L., assistant professor, salary	1,925 00	
Lapp, J. A., salary	157 50	
Lenher, V., assistant professor, salary	2,000 00	
Leith, C. K., professor, salary	2,000 00	
Lutman, B. F., salary, expenses	401 72	
Lee, D. R., assistant, salary	500 00	

Leonard, W. E., instructor, salary	1,000 00	
Madison Paint & Wall Paper Co., paint, etc	12 43	
Mayers, A. A., mdse, drugs	153 68	
Mayhew, Abby S., expenses	15 00	
Madison Gas & Elec. Co., gas and current, mantles, etc.	4,410 98	
Moseley, J. E., stationery, paper	32 85	
Minerallac Co., apparatus	100 00	
Meister, Edw., apparatus	214 60	
McCrea, Mrs. A. E., lectures	28 75	
Mead, W. J., assistant, salary	255 00	
Morgan, G. F., lantern slides	62 70	
McIntosh Stereopticon Co., slides, rheostats	11 75	
McGowan, H. H., dishes	8 10	
Mautz Bros., paints, etc	932 62	
McClurg & Co., A. C., books	13 85	
Mavis & Co., J. M., apparatus	3 30	
Manchester, F. A., salary	40 00	
Mean, F. L., advertising	5 00	
Monarch Typewriter Co., ribbons	3 50	
Meltzer, W. J., plumbing	4 46	
Miller Lock Co., locks	6 40	
Melick, Bertha, indexing	44 00	
Moritz, E. A., instructor, salary	450 00	
McKinley Publishing Co., The, maps	14 18	
Menges Pharmacy, drugs, etc	22 45	
McCarthy, T. C., contracting	333 26	
Marsh & Co., mdse	23 55	
McGilvary, E. B., professor, salary	3,500 00	
McCarthy, Chas., lecturer, salary	1,000 00	
Munro, D. C., supplies, salary	3,270 00	
Moody, S. E., instructor, salary	1,000 00	
Martin, L., assistant, salary	540 00	
Marshall, W. S., associate professor, salary	1,800 00	
Mann, C. R., scholar, salary	225 00	
Miller, W. S., associate professor, salary	2,000 00	
Marquette, W. G., instructor, salary	803 64	
Michell, R. B., instructor, salary	1,100 00	
Macduff, Douglass, assistant, salary	500 00	
March, H. W., instructor, salary	1,000 00	
Mendenhall, C. E., professor, salary	2,500 00	
Miller, L. F., instructor, salary	1,200 00	
McDaniel, A. S., instructor, salary	700 00	
Neilson, E. C., slides, etc	173 07	
Ney, Oscar, apparatus	30 18	
National Distilling Co., alcohol	46 82	
National Blower Works, trap	37 50	
Nelson & Polk, white lead	38 75	
Newbury & Peper, belting, etc	5 81	
Niebuhr, Ernstine, chairs repaired	2 50	
Northern Elec. Mfg. Co., motor	339 50	
Nebraska Teacher, advertising	4 00	
Nelson, George, labor, etc	155 54	
Nelson, K. O., fellow, salary	6 00	
Neudel, R., specimens	6 70	
Newton & Co., lantern slides	14 01	
Nelles, W. R., instructor, salary	900 00	
Neidig, W. J., instructor, salary	1,000 00	
Northrup, G. N., instructor, salary	1,000 00	
North, H. B., instructor, salary and slides	607 65	
Ohio School Journal Co., advertising	2 85	
Olson & Veerhusen, Gloves	3 00	
Ohio Teacher, The, advertising	16 50	
O'Gara Coal Co., The, coal	604 72	
Orr & Lockett Hdwe. Co., moistener	1 50	
Owens, Wm., plumbing	1,500 53	
Ohio Educational Monthly, advertising	10 00	
Overton, J. B., instructor, salary	1,100 00	
Owen, H. E., instructor, salary	1,000 00	
Olive, E. W., instructor, salary	1,100 00	
Owen, E. T., professor, salary	1,833 70	
Otto, M. C., scholar, salary	225 00	
Olson, J. E., professor, salary	2,500 00	
Oswald, Jr., F. W., salary	500 00	
O'Shea, M. V., salary, expenses	2,554 03	
Pickarts, L. J., bursar, postage, contingent	343 39	
Park & Sallie Co., stationery	150 34	
Packard Machinery Co., O. L., apparatus	300 00	
Piper Bros., groceries	78 15	
Paulus Hdwe. Co., Peter, hdwe.	760 52	
Post Publishing Co., printing	239 05	

Pitman, J. M., charts	3 00	
Pollard Lamp Co., cloth, shades, etc.	111 45	
Parkinson Marling Co., lumber	175 46	
Primus Cooking & H. App. Co., stove	4 00	
Parker, C. M., advertising	16 70	
Public School Publishing Co., advertising	17 20	
Parker Educational Co., advertising	6 57	
Philadelphia Therm. Co., apparatus	17 00	
Postal Telegraph Co., messages	93	
Pitman Dry Goods Co., mdse	9 84	
Postmaster, Madison, postage	170 50	
Parke, Davis & Co., serum	2 15	
Paper Mills Co., paper	3 40	
Patterson Dental Supply Co., M. F., composition	1 42	
Palasche, Chas., salary	125 00	
Parsons Printing & Stationery Co., printing, etc.	310 41	
Price, W. H., instructor, salary and expenses	1,006 00	
Parkinson, J. B., vice president and professor	2,500 00	
Paetow, L. J., instructor, salary	1,000 00	
Patzer, Otto, instructor, salary	1,200 00	
Prokosch, E., instructor, salary	1,000 00	
Perrin, F. R., assistant, salary	150 00	
Parker, F. A., professor, salary	2,500 00	
Pyre, J. F. A., assistant professor, salary	1,800 00	
Purin, C. M., student assistant, salary	600 00	
Phillips, U. B., instructor, salary	1,300 00	
Patterson, D. L., instructor, salary	1,200 00	
Queen & Co., coil, apparatus	125 63	
Richards, W. A., salary	100 00	
Remington Typewriter Co., supplies	77 00	
Riley, E. F., secretary, contingent	1 07	
Rand, McNally & Co., maps	36 50	
Roebling & Sons Co., J. A., rope	5 18	
Rankin, C. Adela, salary	15 00	
Randolph, Mabel, stenographic work	37 60	
Reinsch, Paul S., professor, salary	3,300 00	
Roedder, E. C. L., assistant professor, salary	1,600 00	
Russell, H. U., assistant, salary	320 00	
Reed, G. M., assistant, salary	603 83	
Roe, F W., instructor, salary	1,000 00	
Ruggles, A. M., assistant, salary	400 00	
Rosenstengel, Helen A., scholar, salary	225 00	
Roloff, W. E., graduate, salary	600 00	
Russell, H. L., professor, salary	684 00	
Ross, E. A., professor, salary, slides	2,836 65	
Swineford, Mrs. M. L., meals	100 00	
Silver-Burdett & Co., charts	37 50	
Stoelting Co., C. H., apparatus	141 63	
Sims, J. F., expenses	17 76	
Sumner & Morris, Hdwe	491 91	
School Education, advertising	14 00	
Strelinger Co., C. A., dumb waiter	43 52	
Salisbury, Winifred, salary	40 00	
School Science & Mathematics, advertising	15 00	
Spalding & Bros., A. G., spirometer	18 00	
Slatington-Bangor Co., blackboards	953 82	
Schultz, Ernst, apparatus	5 15	
Summer Session salaries, vouchers 259-291 incl.	6,555 07	
Southern School Journal, advertising	9 00	
Sears, Roebuck & Co., gas plates, boilers, tools, etc.	57 51	
Steinheil Sohne, C. A., spectrum apparatus	102 97	
Schwoegler & Bliss, plumbing	158 23	
Stuerke, G. H., paper	7 50	
Sommer & Fglio, G., slides	37 81	
Stephenson & Studemann, hdwe	13 85	
Spencer Lens Co., apparatus, microscope, etc	191 54	
Stark Mfg. Co., F. A., file rack	60 00	
Sunnyside Coal Co., coal	543 98	
Schmidt, Wm., sterilizer, etc.	67 20	
Salter, Jos., steam fitting	146 11	
Sherman, Helen, salary, expenses	161 93	
Steffens, A., running lantern	1 00	
Scott, R. B., instructor, salary	640 00	
Schilling, M., models, etc	126 10	
Sedgwick Machine Works, hoist	42 00	
Stephenson, C H., garbage receiver	3 00	
Schulz Co., A. G., trays	7 50	
Summer School of the South, advertising	20 00	
Southern Ed. Review, advertising	14 00	
Stephens, David, stone	15 70	

Schulz, W. F., meats, etc.	1 00	
Stilwell, L. W., specimens	11 00	
Sieber & Trussell Mfg. Co., paper, etc.	25 00	
Scientific Shops, The, apparatus, instruments	201 15	
Safford Stamp Works, dater, holders	6 90	
Spatula Publishing Co., book	2 70	
Stephenson, Wm., lining casket	7 30	
Slade, M. T., clerical work	127 50	
State Journal Printing Co., printing	30 35	
Stechert & Co., G. E., books	318 47	
Sharp, F. C., professor, salary	2,500 00	
Scott, J. F., assistant, salary	400 00	
Sparling, S. E., assistant professor, salary	1,400 00	
Schaffner, Margaret A., assistant, salary	500 00	
Simmons, Emma G., salary	400 00	
Schlatter, E. B., instructor, salary	1,000 00	
Scott, W. A., director and professor, salary	3,500 00	
Smith, H. A., professor, salary	2,573 81	
Showerman, Grant, salary	1,803 08	
Stephens, G. W., honorary fellow, salary	200 00	
Severins, H. H. P., scholar, salary	225 00	
Smith, E. R., instructor, salary	900 00	
Suydam, V. A., assistant, salary	400 00	
Snow, B. W., professor, salary	3,000 00	
Sievers, A. F., assistant, salary	430 00	
Shanks, L. P., instructor, salary	1,000 00	
Schulz, Raymond L., student assistant, salary	200 00	
Shinn, F. L., instructor, salary	980 00	
Slichter, C. S., professor, salary	3,000 00	
Skinner, E. B., assistant professor, salary	2,000 00	
Slaughter, M. S., professor, salary	3,000 00	
Sterling, Susan A., assistant professor, salary	1,500 00	
Smith, C. F., professor, salary	3,000 00	
Sellery, G. C., director S. S., assistant professor	1,820 40	
Timlin, Winifred L., stenographic work	160 00	
Texas School Magazine, advertising	13 50	
Thompson & Co., A. T., limes	1 00	
Tracy, Gibbs & Co., printing	171 45	
Teachers Printing Co., advertising	49 00	
Truax, Greene & Co., skeleton	25 00	
Texas School Journal, advertising	18 00	
Tyrrell, Jos., cases	6 80	
Trowbridge, A., salary	600 00	
Teachers' Journal Ptg. Co., advertising	8 00	
Thordarson, C. H., induction coil	90 00	
Thomas Co., A. H., jars, instruments, etc.	886 74	
Todd, Co., A. M., oils	22 50	
Teubner, B. G., models	67 60	
Taylor & Gleason, printing	7 50	
Terry, E. M., instructor, salary	900 00	
Tibbals, Jr., C. A., salary	600 00	
Taylor, A. H., assistant professor, salary	1,400 00	
Tressler, A. W., inspector of schools, salary	2,000 00	
Taylor, H. C., assistant professor, salary, expenses	1,607 62	
Turner, F. J., professor, salary	4,000 00	
Underwood, L. M., cards	11 83	
Underwood & Underwood, views	9 00	
University of Nebraska, slides	140 00	
University of Chicago Press, advertising	21 60	
University Pay Roll, labor, etc.	13,162 78	
University Co-op Co., stationery	45 95	
U. S. Express Co., express	20 02	
Valvoline Oil Co., oil	25 70	
Vinogradoff, P., salary	500 00	
Voss, Ernst, professor, salary	2,700 00	
Volk, F. E., graduate, salary	112 50	
VanVleck, E. B., professor, salary	3,008 00	
Vorhies, C. T., assistant, salary	800 00	
Veerhusen, Elsbeth, instructor, salary	1,000 00	
Wiedenbeck, Dobelin & Co., hdwe.	27 41	
Ward's Natural Sci. Establishment, models	119 50	
Walsh Window Tent Co., window tent	5 00	
Warner, W. W., rent of piano, etc., tuning	7 00	
Weston Elec. Inst. Co., ammeters	141 42	
Western School Journal, advertising	13 50	
Whiting Paper Co., paper	15	
Williams, Brown & Earle, apparatus	34 00	
Weinzirl, John, salary	40 00	
Wrench, J E., salary	143 17	
Whitall Tatum Co., instruments, etc.	39 62	

Wolff, Kubly & Hirsig, hdwe.	69 63	
Wadhams Oil Co., waste	10 31	
Waltzinger, C., supplies	1 95	
Ward & Co., Montgomery, supplies	12 80	
Whitcomb, R. C., delivering body	3 30	
Williams, W. H., professor, salary	900 00	
Western Union Telegraph Co., messages	6 81	
Wolff, H. C., instructor, salary	1,200 00	
Weber, A. W., assistant, salary	500 00	
Woolley, E. C., instructor, salary	1,000 00	
Williams, E. H., assistant, salary	400 00	
Weniger, W., fellow, salary	400 00	
Woods, H. S., instructor, salary	720 00	
Wild, E., assistant, salary	600 00	
Wolesensky, Edw., scholar, salary	225 00	
Waldron, C. LeV., fellow, salary	400 00	
Wetzel, R. A., assistant, salary	400 00	
Woodward, Cora S., dean of women, salary	2,000 00	
Wayson, N. E., assistant, salary	600 00	
Wagner, George, instructor, salary	1,100 00	
Yale & Towne Mfg. Co., keys, etc	1 66	
Yawkey Crowley Lbr. Co., lumber	477 39	
Zeiss, Carl, apparatus	1,112 33	
Zehnter Co., J., mdse	18 18	
Total		$366,022 18

COLLEGE OF ENGINEERING

Advance Thresher Co., repair parts	2 23	
Aluminum Co. of America, sheet aluminum	18 22	
American Machinist, advertising	3 00	
Acheson Graphite Co., carbons	68 55	
Abbe Engineering Co., laboratory mill, jars	37 00	
Austin Separator Co., separator	22 50	
American Steam Gauge & Valve Mfg. Co., fittings	12 60	
Alberene Stone Co., stones	31 60	
Anderson, B. S., machinist and instructor, salary	241 40	
American Meter Co., meters	320 00	
Atwood, J. T., instructor, salary	1,000 00	
American Steam Pump Co., pump	67 50	
Andrews Co., A. H., chairs	435 00	
American Express Co., express	47 57	
American Spiral Pipe Works, bolts, etc	39 50	
Abbott, E. P., assistant, salary	102 70	
Administration pay roll, clerks, etc	928 33	
American Foundry & Mach. Co., copper	36 79	
Acme Brick Co., brick	383 63	
Andrae & Sons Co., J., marble panel	32 32	
Brown, P. V., student assistant, salary	36 50	
Behnish, Chas. E., student assistant, salary	12 40	
Blied & Co., F. C., printing, blanks	12 00	
Barbee Wire & Iron Works, wire netting	25 35	
Brown, C. C., expenses	30 00	
Burger, Peter, hardware	38 80	
Beebe, M. C., expenses	99 80	
Brand Stove Co., castings	22 50	
Brown, S. S., student assistant, salary	36 88	
Bull, Storm, professor, salary	2,700 00	
Blied & Schneider, hardware	72 25	
Bischoff, Geo. L., plastering	311 01	
Breitenbach Bros., rubber boots	11 00	
Burch, Louis H., professor, salary	250 00	
Bishop & Co., J., crucibles	118 29	
Burgess, C. F., professor, salary	2,500 00	
Blake Bros., building material	1,519 00	
Beil & Zoller Co., coal	7 68	
Bristol Co., The, gauge	40 00	
Breckenridge, L. P., expenses	25 00	
Biddle, James G., apparatus, voltmeters	329 33	
Bausch & Lomb Opt. Co., chemicals	161 42	
Burnside, C. H., assistant professor, salary	1,830 00	
Beebe, M. C., associate professor, salary	2,000 00	
Burnett, Earle S., research assistant, salary	600 00	
C., M. & St. P. Ry. Co., freight	513 07	
C. & N. W. Ry. Co., freight	156 81	
Crane Co., pipe and fittings	723 26	
Chicago Brass Co., brass tube	19 65	
Cantwell Printing Co., printing	53 90	

Curtiss, F. W., photo work	45 00	
Carterville Washed Coal Co., coal	151 66	
Capital City Paper Co., paper	10 36	
Crosby Steam Gage Co., gage, indicator cord	208 77	
Chicago Brass Co., copper	3 68	
Chicago Pulley & Shafting Co., shafting	45 00	
Cleghorn, M. P., professor, salary	100 00	
Conklin & Sons, cement	35 40	
Carpenter & Co., G. B., packing	8 87	
City of Madison, water	36 00	
Chatillon & Sons, John, balance	5 25	
Cortelyou, G. S., salary	15 25	
Cooley, C. F., cement	1,254 74	
Clow & Sons, James B., fittings	19 92	
Chisholm & Moore Mfg. Co., The, hoist	73 00	
Dixon Crucible Co., J., graphite slabs	7 20	
Davis, G. J., instructor, salary	1,400 00	
Dresen & Rhodes, painting	92 80	
Democrat Printing Co., printing	66 50	
DeLay, F. A., instructor, salary	100 00	
Dengler, C. M., lettering	11 50	
Davis, Louis L., lenses	9 00	
Deane Steam Pump Co., The, packing	21 96	
Denver Fire Clay Co., muffles	4 00	
Dickerman, J. C., assistant professor, salary	1,500 00	
Dietzgen Co., E., file, level rods	27 01	
Dane County Telephone Co., rentals	24 00	
Daigger, A., tubing	9 53	
Doyon & Rayne Lumber Co., lumber	65 67	
Diederich, M., mdse	4 10	
Davis Co., The John, fittings, hardware	512 08	
Engle, S. G., scholar, salary	225 00	
Elliott, H. S., instructor, salary	1,000 00	
Ender Coal & Coke Co., coal	251 61	
Engineering News, advertising	4 12	
Egelhoff, R. F., instructor, salary	3 25	
Eimer & Amend, repairs, thermometers, chemicals	81 35	
Electric Appliance Co., wire	52 31	
Excelsior Supply Co., tubing	7 76	
Electrical Supply Co., electrical mdse	463 61	
Fuller, Clifford, assistant, salary	24 18	
Frederickson, A. D. & J. V., lumber	2,728 83	
Fisher, F. E., student assistant, salary	25 60	
Fairbanks, Morse & Co., engine, scales	1,182 00	
Foote Mineral Co., minerals	4 00	
Fussell, Lewis, assistant, salary	400 00	
Foster, D. E., instructor, salary	800 00	
Fuller & Johnson Mfg. Co., bolts, hardware, studs	7 92	
Falk Co., The, apparatus, castings	331 74	
Gisholt Machine Co., castings	73 98	
Gould, Wells & Blackburn Co., mdse	8 27	
Gross, G. E., salary	153 25	
Greig, John, furniture	120 50	
Gould Co., The, pump	60 70	
Gamm, W. J., repairing stop watches	8 80	
Gross Hardware Co., P., shelf rests	4 00	
Geographic Society of Chicago, lantern slides	18 45	
Gaertner & Co., Wm., strips of silver	12 50	
General Electric Co., lamps, panel	159 38	
Gillespie, J. E., salary	9 00	
Hafer & Son Coal Co., Henry, coal	549 31	
Hatch, S. R., research work, salary	42 50	
Hamburger, Felix, arch lights	64 80	
Holcomb Mfg. Co., J. I., floor brushes	3 75	
Hunt, H. J., assistant, salary	110 66	
Huels, F. W., instructor, salary	900 00	
Holben, M. W., student assistant, salary	8 25	
Humphrey Co., heater	16 00	
Haswell Furniture Co., furniture	46 55	
Harza, L. F., instructor, salary	1,000 00	
Heat, light and water, percentages	6,777 13	
Huels, F. W., expenses	7 90	
Hanson & Van Winkle Co., The, silver anodes	50 16	
Harloff, P. F., electrical mdse	33 90	
Harris & Co., Samuel, bronze, steel, brass tubing, etc	240 45	
Hines, C. B., lantern slides	50 40	
Henion & Hubbell, hose, gauges	11 93	
Holmes, H. M., student assistant, salary	29 50	
Illinois Electric Co., electric mdse	123 89	
International Brass & Electric Co., posts	8 00	

Illinois Brick Co., brick	337 50	
Illinois Central Ry. Co., freight	3,257 00	
Jackson, D. C., professor, salary	1,350 00	
Johnson Service Co., installation heat regulation	135 00	
Keuffel & Esser, instruments, machine, transit	216 63	
Knott Apparatus Co., L. E., barometers	6 10	
Kempf, John J., insurance premium	570 77	
Keller & Co., P., instruments	2 50	
Kinne, W. S., expenses	58 40	
Kroeschel Bros. Ice Mach. Co., labor, packing	37 00	
Kerr, Carl M., student assistant, salary	41 12	
Kateley, Fred, assistant, salary	375 00	
Keown, R. McA., expenses	21 65	
Kinne, W. S., instructor, salary	1,000 00	
King, C. I., professor, salary	1,250 00	
Johns-Manville Co., H. W., covering	330 28	
Keyes, Wm., hauling brick, sand and coal	737 27	
Ketchum, H. E., apparatus	37 50	
King & Walker Co., castings	494 58	
Kratsch, Henry, instructor, salary	1,150 00	
Kroncke Bros., hardware	217 25	
Keown, R. McA., instructor, salary	1,200 00	
Kowalke, Otto L., assistant, salary	500 00	
Klein Bros., supplies	2 23	
Lufkin Rule Co., tapes	6 75	
Love Mfg. Co., M. A., gate hoists	22 95	
Lake, E. J., professor, salary	250 00	
Lottes, W. G., instructor, salary	1,100 69	
Lowe, E. A., expenses	57 85	
Lutze, H. F., student assistant, salary	41 70	
Ludowici Celadon Co., tile	757 60	
Larson, C. M., salary	56 80	
Lunkenheimer Co., The, valves	23 16	
Lawrence, F. W., assistant, salary	575 00	
Loew, Edgar A., instructor, salary	800 00	
Lorenz, E. H. J., remodeling	11 65	
Lorenz, E. H. J., mechanician, salary	1,310 00	
Modern Steel Struct. Co., piece for machine	10 00	
McCullough, F. M., instructor, salary	1,000 00	
Mack, J. G. D., professor, salary	2,800 00	
Martin, L., assistant, salary	60 00	
Mautz Bros., paints	352 58	
McCullough, F. M., expenses	58 34	
Mainland, John, student assistant, salary	69 00	
Madison Paint & Wall Paper Co., glass, paint	12 10	
Malec & Bro., V., leather	1 25	
Menges Pharmacy, mdse.	17 95	
Middleton, O. W., student assistant, salary	23 50	
McCarthy, T. C., contracting	2,249 36	
Moseley, James E., stationery	23 50	
Madison Gas & Elect. Co., gas and current	1,398 38	
Madison Tent & Awning Co., rent tarpaulin, awnings	20 50	
Moritz, E. A., instructor, salary	138 50	
Mead, D. W., professor, salary	3,000 00	
Moore, H. F., expenses	17 78	
Madison-Kipp Lub. Co., brass	1 53	
Millar, A. V., instructor, salary	1,350 00	
Mayers, A. A., mdse.	157 29	
Marx, W. F., assistant, salary	125 00	
Mandel Engraving Co., plates	24 92	
Moles, E. S., instructor, salary	900 00	
Mueller Co., The, apparatus, caps	60 04	
Maurer, E. R., professor, salary	2,500 00	
Moore, H. F., instructor, salary	1,400 00	
Mechanical Rubber Co., tubing	20 96	
Miller Lock Co., locks	73 60	
Meltzer, W. J., plumbing	150 00	
Michigan Pipe Co., wood pipe	36 77	
McIntosh, W. H., instructor, salary	700 00	
Newton Co., G. C., conveyors	7 50	
Noe, Edgar J., castings	28 85	
Niebuhr, E., repair chairs	3 00	
Northern Elect. Mfg. Co., brass, motors, etc.	1,558 81	
Polk, Nelson S., white lead	37 12	
North, H. B., slides	111 70	
National Carbon Co., batteries	47 25	
Nielson, E. C., photo work, slides	83 70	
National Blower Works, traps, steam trap	55 00	

Newbury & Peper, shafting, pulleys	238 75	
Owen, Ray S., instructor, salary	1,100 00	
Owens, Wm., plumbing	94 37	
Oxford Tripoli Co., The, fossil flour	6 30	
Olson & Co., Tinius, grips	28 50	
Orr & Lockett Hardware Co., hardware	10 80	
O'Gara Coal Co., coal	332 25	
Olson, E., student assistant, salary	30 30	
Penn, W. C., student assistant, salary	215 60	
Postal Telegraph Co., messages	2 84	
Pleh, J. F., sand	11 90	
Petura, F. J., instructor, salary	100 00	
Platt Iron Works, model	90 00	
Pitman Dry Goods Co., mdse.	2 00	
Pollard Lamp Co., shades	24 00	
Pritzlaff Hardware Co., J., zinc	8 16	
Postmaster, Madison, postage	30 00	
Paper Mills Co., paper	6 40	
Potter, J. C., instructor, salary	900 00	
Parke & Saffle Co., stationery	25 80	
Pickarts, L. J., bursar, postage, cash advanced, etc	111 80	
Parsons Ptg. & Sta. Co., printing	130 30	
Phillips, J. D., professor, salary	2,300 00	
Price, John R., instructor, salary	800 00	
Pence, W. D., professor, salary	2,700 00	
Peck, O. R., student assistant, salary	9 65	
Parkinson-Marling Lbr. Co., lumber	53 00	
Potter, J. C., expenses	22 60	
Post Publishing Co., printing	243 85	
Paltz, John, cleaning rugs	1 30	
Payton, Martin, salary	219 00	
Parker, E. E., student assistant, salary	1 75	
Queen & Co., instruments	13 50	
Rochester Electric Motor Co., motor	31 00	
Reichhelm & Co., E. P., support for melter	1 00	
Reid, J. W., student assistant, salary	31 35	
Remington Typewriter Co., typewriter, etc.	115 00	
Richter, A. W., professor, salary	2,300 00	
Riley, E. F., secretary, contingent	1 35	
Rundle-Spence Mfg. Co., fittings	17 11	
Reynolds, E. S., drayage	38 00	
Sanford, H. B., student assistant, salary	175 00	
Sperry & Co., D. R., castings, filter press	150 46	
Smith, L. L., scholar, salary	225 00	
Sherman, J. R., student assistant, salary	27 75	
Schapirograph Co., The, negative paper	2 00	
Shelby Elect. Co., The, lamps	3 60	
Sanborn, R. A., expenses	17 34	
Shuster, J. W., assistant professor, salary	1,825 00	
Sargent Steam Meter Co., steam meters	59 00	
Sauveur, A., microscope	125 00	
Schlimgen, Fred, marble	7 25	
Shaad, Geo. C., instructor, salary	225 00	
Stephens, David, crushed stone	15 74	
Sears, Roebuck & Co., tools	45 37	
Strelinger, Chas. A., tubes	6 67	
Shealy, E. M., instructor, salary	1,100 00	
Sumner & Morris, hardware	483 78	
Smith, L. S., associate professor, salary	2,200 00	
Stephenson & Studemann, hardware	78 45	
Sargent & Co., E. H., chemicals	37 60	
State Journal Printing Co., paper	4 25	
Stewart, C. B., research assistant, salary	1,553 06	
Sayle, George, lumber	1,255 24	
Smith Countershaft Co., countershaft	23 00	
Schaeffer & Budenberg Mfg. Co., screws	2 50	
Sinaiko Bros., iron, lead	11 28	
Sunnyside Coal Co., coal	204 04	
Standard Oil Co., oil	8 40	
Schoelkopf, L. F., steel balls	1 25	
Scott, C. F., expenses	40 00	
Steen, J. C., superintendent, salary	1,525 00	
Schulz & Knabe, castings	1 68	
Schutte & Koerting Co., apparatus	23 92	
Tagliabue Mfg. Co., Chris. J., machines	45 00	
Taylor & Gleason, printing	7 00	
Thompson, J. T., salary	40 50	
Thompson & Co., A. T., lantern, etc.	158 10	

Thordarson, C. H., furnace regulator, induction coil, etc.	611 80	
Thorkelson, H. J., expenses	59 58	
Thorkelson, H. J., assistant professor, salary	1,825 00	
Tight Joint Co., bushings	24 20	
Tracy, Gibbs & Co., printing	119 75	
Trooien, Ole N., scholar, salary	238 75	
Troy, J. P., slides	76 25	
Turneaure, F. E., dean and professor, salary	3,500 00	
Turneaure, F. E., expenses, car fare	182 85	
University pay roll, clerks, etc.	10,661 52	
Union Fibre Co., linofelt	4 25	
United States Express Co, express	15 84	
University Co-operative Co., stationery	98 45	
United States Cast Iron Pipe Foundry Co., pipe	58 00	
Vilter Mfg. Co., The, caps, pipe	30 00	
Vossknehler, J. H., expenses	58 45	
Van Zandt, J. G., expenses	17 22	
Valvoline Oil Co., oil	84 87	
Van Zandt, J. G., assistant, salary	500 00	
Vosskuehler, J. H., instructor, salary	1,400 00	
Yawkey-Crowley Lumber Co., lumber	414 22	
Western Electric Co., hard rubber, electrical mdse.	111 52	
Woodward Governor Co., governor	200 00	
Wetzel, Wile, machinist, salary	10 50	
White Dental Mfg. Co., S. S., oxygen	5 80	
Western Kieley Steam Specialty Co., valve, diaphram	19 50	
Western Union Telegraph Co., messages	1 28	
Wolff, Kubly & Hirsig, pipe, hardware	315 23	
Wetzler, W. H., machinist, salary	34 84	
Wehrmann, Chas. repairing	1 50	
Watson, J. W., instructor, salary	1,200 00	
Westinghouse Electric & Mfg. Co., motor	165 60	
Wheeler, A. D., expenses	25 00	
Withey, M. O., instructor, salary	1,200 00	
Webster Mfg. Co., apparatus	12 17	
Western Electric Inst. Co., meters	112 02	
Wisconsin Telephone Co., messages	1 10	
Wisconsin Engineer, The, advertising	25 00	
Wood & Co., R. D., testing apparatus	650 00	
Wickenden, W. E., instructor, salary	800 00	
Wisconsin Bridge & Iron Co., frame	353 57	
Whitehead Co., J. H., machine	31 54	
Wied, J. C., student assistant, salary	90 47	
Wilson Maeulen Co., pyrometer	127 50	
Wray, Edward, scholar, salary	22 50	
Withey, M. O., expenses	33 00	
Williams, L. D., instructor, salary	1,200 00	
Wiedenbeck, Dobelin & Co., hardware	485 68	
Watts, Oliver P., instructor, salary	1,200 00	
Welsbach Co., mantles	2 75	
Winslow Bros. Co., The, iron letters	85 00	
Watson, J. W., traveling expenses	58 70	
Wescott, E. B., salary	252 50	
Total	- - - - -	$134,417 46

MILITARY DEPARTMENT

Administration Pay Roll, clerks, etc.	$15 00	
American Express Co., express	85	
Band pay roll, musicians	283 50	
Barnhonse, C. L., music	1 95	
Blatz, G. G., fees refunded	10 00	
Bennett, F. B., fees refunded	10 00	
Brandel, C. O., fees refunded	10 00	
Birkett, M. W., fees refunded	10 00	
Curtis, C. A., commutation of quarters, flags	412 74	
Cubbison, D. C., fare	19 60	
Clark, C. R., fees refunded	10 00	
Conn Co., C. G., clamps	1 50	
Cunningham, J. W., fees refunded	10 00	
Cooley, C. F., lime and cement	11 90	
Cantwell Printing Co., printing	9 50	
C. & N. W. Ry. Co., freight	6 38	
C. M. & St. P. Ry. Co., freight	119 58	
Democrat Printing Co., printing, etc.	32 25	
Electrical Supply Co., mdse.	3 20	

Fillmore Brass Co., The, horn	97 30	
Frederickson, A. D. & J. V., lumber	50 87	
Gallagher Co., J., awnings, etc.	4 50	
Gilmore Band Library Pub. Co., music	9 75	
Heinz, A., fees refunded	10 00	
Hefty, T. J., fees refunded	10 00	
Hartung, W. J., fees refunded	10 00	
Hopson, H. C., fees refunded, salary, prize	195 00	
Holton & Co., Frank, instruments	10 00	
Haswell & Co., A., furniture	122 60	
Johnson, A. A., fees refunded, prize	60 00	
Jacobs, W., band music	8 96	
Kornhauser & Co., A., mdse.	45	
Kroncke Bros., hdwe.	23 24	
Laird, J. M., fare	19 60	
Lilley, & Co., M. C., swords, etc.	16 17	
Lyon & Healy, instruments and music	180 40	
Mercein, C. S., fees refunded	10 00	
Monarch Typewriter Co., typewriter desk, etc.	107 04	
Mautz Bros., paints, etc	8 30	
Nicodemus, R. C., premium	256 51	
Newbury & Peper, steel, etc.	5 22	
O'Connell, J. W., Cap't., rent of range	15 00	
Owens, Wm., plumbing	2 80	
Parsons Ptg. & Sta. Co., printing and stationery	60 40	
Pickarts, L. J., bursar, contingent and postage	8 94	
Rice, C. J., fees refunded	10 00	
Robinson, E. E., fees refunded	10 00	
Rapp, F. H., cleaning guns	39 90	
Riley, E. F., secretary, contingent	12 75	
Reynolds, E. S., drayage	4 00	
Roebling's Sons Co., J. A., halliards	2 05	
Russell, G. C., Agent, premium	36 87	
Slate, M., music	3 75	
Sumner & Morris, hdwe.	3 00	
Schwenker, P. F., fees refunded	10 00	
Stern & Co., J. W., music	5 87	
Teschan, W. F., fees refunded	10 00	
University Pay Roll, janitors, etc.	433 35	
Underwood, W. S., fees refunded and prize	60 00	
U. S. Express Co., express	2 03	
Wolff, Kubly & Hirsig, hdwe.	16	
Wisconsin Music Co., instruments, etc.	32 38	
Wiedenbeck, Dobelin & Co., hdwe	16	
Williams, L. R., Maj., cartridges	2 26	
Yawkey-Crowley Lumber Co., lumber	52 36	
Total		$3,050 80

ADMINISTRATION

Automatic File & Index Co., supplies, guides, case	$142 53	
Atwell, W. E., assistant, salary	89 00	
Apter Typewriter Supply Co., carbon paper	3 00	
Angell & Co., G. R., directories	12 00	
American Gymnasia, subscription	1 50	
American Express Co., express	6 45	
Administration Pay Roll, clerks, etc.	19,558 35	
Bradley, W. C., expenses	20 36	
Brown Bros., livery	2 00	
Berger Mfg. Co., omnibus	115 00	
Browne, E. E., expenses	74 90	
Burchell, D. Earle, auditor and professor, salary	400 00	
Capital City Paper Co., paper	3 69	
C. M. & St. P. Ry. Co., freight	9 38	
College Book Store, stationery	4 45	
C. & N. W. Ry. Co., freight	5 17	
Conklin & Sons, ice	14 55	
Cantwell Printing Co., printing, etc.	140 10	
Clark, O. E., expenses	45 15	
Doescher, John, repairing, etc	75	
Democrat Printing Co., printing, etc.	37 25	
Dane County Telephone Co., rentals	64 00	
Dewolf, E. I., pens	1 50	
Dunwiddie, B. F., expenses	18 60	
Elmore, J. H., expenses	49 04	
Electrical Supply Co., mdse.	2 00	

Grimm's Book Bindery, binding	45 00	
Gilbertson, A., expenses	23 76	
Gast Bank Note & Lith. Co., A., fluid	1 75	
Hoard, W. D., expenses	23 37	
Haswell Furniture Co., furniture	136 50	
Hooper, J. T., expenses	100 08	
Illinois Cent. Ry. Co., freight	40	
Kinsman, D. O., expenses	31 05	
Kentzler Bros., livery	8 00	
Keller, Gustave, expenses	10 90	
Library Bureau, cards, cases	44 10	
McClurg & Co., A. C., books	6 23	
Madison Gas & Electric Co., gas and current	45 88	
Moseley, Jas. E., pens, stationery	7 30	
Mead, M. C., expenses	104 36	
Menges Pharmacy, mdse., stationery, drugs, etc.	3 05	
Myrland, A. J., expenses	161 75	
Miller Co., H. C., ledger, leaves, etc	24 40	
McElroy, W. J. expenses	100 91	
Mueller Bros., pictures	6 95	
Moore, J. C., corporation, stationery	15 50	
Merrill, G. F., expenses	239 44	
McConnell, J. E., expenses	38 60	
Nicodemus, R. C., premium	50 00	
Nelson, A. P., expenses	107 66	
Parkinson, J. B., vice-president, salary	500 00	
Postmaster, Madison, postage	355 42	
Puls, A. J., expenses	61 50	
Park & Saffle Co., mdse., stationery	335 83	
Pickarts, L. J., bursar, postage, cash advanced, bills paid	950 89	
Postal Telegraph Co., message	25	
Parker, D. T., expenses	53 00	
Parsons Ptg. & Sta. Co., printing, etc.	1,564 59	
Quickeasy Copy Press Co., paper, cabinet	14 40	
Rockwell-Wabash Co., cases, indexes	8 62	
Remington Typewriter Co., supplies	12 00	
Riley, E. F., secretary, contingent	16 89	
Sewell-Clapp Mfg. Co., envelopes	84 47	
Shea, Smith & Co., paper	9 00	
Schranck, H. C., expenses	50 25	
Sweet, H. E., expenses	23 12	
Saltzstein & Bro., C., paper	39 45	
Sumner & Morris, hardware	1 50	
Swart, Rose Co., expenses	30 35	
Sieber & Trussell Mfg. Co., paper, ledgers, etc	54 02	
Security Audit Co. of N. Y., examination	287 50	
Spensley, J., expenses	31 55	
Stephenson & Studemann, hardware	1 50	
State Journal Co., printing	24 00	
Tension Envelope Co., envelopes	53 03	
Taylor & Gleason, printing	27 25	
Tracy, Gibbs & Co., printing, etc	203 55	
United States Express Co., express	2 65	
United States Blue Print Paper Co., paper, prints	2 16	
University Cooperative Co., stationery	69 85	
University pay roll, labor, etc.	53 11	
Utter, D., expenses	36 25	
Van Hise, C. R., contingent, salary, expenses	7,592 83	
Wolff, Kubly & Hirsig, hardware	2 15	
Whitfield Carbon Paper Co., paper	32 75	
Wisconsin Telephone Co., messages	2 75	
Total		$34,871 15

COLLEGE OF LAW

Adams & Co., Reed, books	$6 00	
American Law Register, subscription	3 00	
American Express Co., express	3 41	
Administration pay roll, clerks, etc	1,323 10	
American Seating Co., chairs	456 80	
American Law Book Co., books	16 60	
Apter Typewriter Supply Co., carbons	2 50	
Burger, Peter, hardware	10	
Boston Book Co., books	3,430 98	
Bashford, R. M., salary	2,000 00	
Bell & Zoller Co., coal	1 15	

Barbee Wire & Iron Works, guards	78 00	
Beckwith, G. M., books	7 75	
Bender & Co., M., books	76 50	
Banks Law Publishing Co., books	370 58	
Bancroft-Whitney Co., books	17 50	
Cantwell Printing Co., printing, etc.	44 60	
Cook, W. W., professor, salary	2,600 00	
Carterville Washed Coal Co., coal	22 75	
Cooley, C. F., coal, cement	187 90	
Chicago & Northwestern Railway Co., freight	20 40	
Central Law Journal Co., books	5 00	
Capital City Fuel Co., plaster	4 38	
Callaghan & Co., books	55 55	
Columbia Law Review, subscription	2 50	
City of Madison, water	4 00	
C. M. & St. P. Ry. Co., freight	3 92	
Dane County Telephone Co., rentals	12 00	
Dickey, J. R., books	2 00	
Dearborn Foundry Co., beams	51 69	
Dissette, E J., dictionary	49 00	
Democrat Printing Co., printing, etc.	42 75	
Elect. Supply Co., elect. mdse.	14 70	
Ender Coal & Coke Co., coal	37 75	
Flood & Co., books	230 00	
Fiske & Co., books	3 00	
Frederickson, A. D. & J. V., lumber	299 63	
Gross Hardware Co., P., hardware	6 00	
Grimm's Book Bindery, binding	30 75	
Gilmore, E. A., professer, salary	2,500 00	
Holcomb Mfg. Co., C. I., brushes	50	
Heat, light & water, percentages	966 91	
Horack, H. C., professor, salary	2,200 00	
Hafer & Son Coal Co., H., coal	82 41	
Huels, F. W., keys, etc.	1 25	
Harvard Law Review Association, subscription	5 00	
Haswell & Co., A., furniture	40 75	
Illinois Law Review, subscription	3 00	
Ill. Cent. Ry. Co., freight	487 50	
Jones, B. W., lecturer, salary	930 00	
Jones, George I., books	80 00	
Kempf, Treas. J. J., premium	190 26	
Kroncke Bros., hardware	14 50	
Keefe-Davidson Co., books	13 00	
Keyes, Wm., hauling coal	80 20	
Lucas, F. W., salary	20 25	
Lawyers' Co-op. Pub. Co., books	22 00	
Miller Lock Co., locks	64 00	
Michigan Law Review, subscription	2 00	
Mautz Bros., painting, etc.	36 69	
Madison Gas & Electric Co., gas and current	253 28	
Moseley, J. E., stationery	2 50	
Northern Elect. Mfg. Co., motor, etc.	1 60	
New York Law Book Co., books	15 00	
Olin, J. M., lecturer, salary	1,050 00	
Owens, Wm., plumbing	198 09	
O'Gara Coal Co., The, coal	49 04	
Park & Saffle Co., stationery	16 06	
Parsons Ptg. & Sta. Co., printing, etc.	54 92	
Post Publishing Co., printing	48 27	
Parkinson-Marling Lumber Co., lumber	85 50	
Pickarts, L. J., bursar, postage	118 60	
Postmaster, Madison, postage	20 10	
Richards, H. S., dean and professor, salary	3,800 00	
Sunnyside Coal Co., coal	44 11	
Sumner & Morris, hardware	8 55	
Small & Stevens, bicycle pump	20	
Statute Law Book Co., books	559 50	
Sargent, F. B., librarian, salary	66 73	
Sinaiko Bros., rags	1 25	
Shepard Co., Frank, The, books	2 50	
Smith, H. L., professor, salary	3,250 00	
Thompson Co., E., books	61 75	
United States Express Co., express	1 18	
University pay roll, labor, etc.	1,281 22	
Williamson Law Book Co., books	56 10	
Wisconsin Telephone Co., message	25	
Wing, G. W., books	5 00	

Wade, C. C., books	18 00	
West Publishing Co., books	292 25	
Western Union Telegraph Co., messages	85	
Yale Law Journal, subscription	2 50	
Total		$30,677 36

PHYSICAL CULTURE

Administration pay roll, clerks, etc.	80 70	
Anderson, B. S., machinist	4 50	
American Express Co., express	7 40	
Alford Bros., laundry work	62 05	
Angell, E. D., salary and expenses	1,514 70	
Blied & Schneider, hardware	3 93	
Bass, Elizabeth, salary	800 00	
Burdick & Murray Co., mdse.	3 15	
Barckham, W. G., drapery	3 94	
Bell & Zoller Co., coal	6 58	
Barbee Wire & Iron Works, guards, etc.	572 25	
Brunswick-Balke Col. Co., bowling balls	6 00	
Briggs, George, labor	58 15	
Baker, J. B., professional service	5 00	
Benedict, G. S., bill posting, etc	5 00	
Brown Bros., straps	2 50	
Bent, G. P., piano	400 00	
Burger, Peter, hardware	2 90	
Borkhans, L., rent	5 00	
Crane Co., pipe, etc.	16 13	
Cantwell Printing Co., printing	25 25	
City of Madison, water	21 35	
Cooley, C. F., coal	954 01	
Collyer's Pharmacy, drugs, etc.	88 30	
Conlin, D. F., drayage	7 54	
Chase, S. H., professional services	16 50	
Cullen, E. A., rubbing	6 00	
C. & N. W. Ry. Co., freight	30 19	
Conklin & Sons, cement, etc.	1 80	
C. M. & St. P. Ry. Co., freight	1 90	
Carterville Washed Coal Co., coal	128 92	
Dieges & Clust, medals	144 50	
Daily Cardinal, The, advertising	20 00	
Dengler, C. M., lettering	50 52	
Doyon & Rayne Lbr. Co., lumber	19 19	
Democrat Printing Co., printing, etc.	3 25	
Diederich, M., groceries	1 25	
Esser, Mrs. L., canvass, etc.	1 41	
Eddy, Roy T., salary	4 00	
Eastman, J. S., tape	4 50	
Elsom, J. C., professor, salary	1,800 00	
Elec. Supply Co., mdse.	95 11	
Fair, The, blankets, etc	16 23	
Faber, M. E., care of courts	15 00	
Findlay, A. R., expenses	2 85	
Frederickson, A. D. & J. V., lumber	1,353 80	
Gamm, W. J., clock	4 00	
Gelbach, W. A., expenses	20 11	
Gilbert, L. B., mortar	12 88	
Gould, Wells & Blackburn Co., mdse.	75	
Hutchins, C. P., professor, salary and expenses	3,048 13	
Hollister Drug Co., drugs	8 55	
Haak, Augusta, charwoman	3 60	
Huels, F. W., keys, locks	4 40	
Haswell Furniture Co., furniture	3 00	
Huber Co., H., The, thermometer	1 50	
Heat, light and water, percentages	5,881 14	
Houghton, Kathrine, stenographic work	9 20	
Harloff, P. F., mdse	3 00	
Hoeveler, T., upholstering	18 00	
Hafer & Son Coal Co., H., coal	466 90	
Holcomb Mfg. Co., J. I., brushes	50	
Hibbard, A. C., guards	38 00	
Illinois Elec. Co., mdse.	101 75	
Illinois Central Ry. Co., freight	2,757 42	
Johns-Manville Co., H. W., pipe covering, etc.	16 54	
Johnson, A. A., expenses	12 05	
Kroncke Bros., hdwe.	1 50	

Kingston, Paul, hack	1 25	
Keeley, Neckerman & Kessenich, rug, etc.	18 00	
Kuehmsted, A., balance due	5 00	
Kerns Co., The E. J., seats	30 50	
Klueter Bros., lime	1 10	
Keyes, Wm., hauling coal	454 45	
Kempf, J. J., treasurer, premium	304 41	
Laaw Stables, carryalls, livery	10 00	
Lee Scanlon, Mrs., rent, etc	193 95	
Lottes, W. G., instructor, salary	6 48	
Menges Pharmacy, mdse., drugs, etc.	36 85	
Meltzer, W. J., plumbing	9 81	
Madison Gas & Elec. Co., gas and current	602 39	
Moseley, Jas. E., stationery	1 65	
Madison Tent & Awning Co., repairing, awnings, etc.	13 50	
Malec & Bro., V., repairs	8 35	
Mayers, A. A., hdwe., mdse.	22 90	
Mayhew, Abby S., asst. professor, salary	1,600 00	
Mautz Bros., painting, etc.	45 28	
Melzner, A. B., services	1 50	
Minch, H. J., feed	50	
Narragansett Machine Co., poles, wrenches, etc.	48 15	
Nitschke, Sr., C., music	3 00	
O'Gara Coal Co., The, coal	277 85	
O'Dea, A. M., salary	300 00	
Owens, Wm., plumbing	93 58	
Pickarts, L. J., bursar, cash advanced	6,978 85	
Postal Telegraph Co., messages	9 37	
Park & Saffle Co., stationery	21 65	
Pantorium Co., The, repairs	55 40	
Pickarts, Mary E., pianist, salary	500 00	
Postmaster, Madison, postage	7 00	
Parsons P. & S. Co., postage and stationery	192 20	
Partridge & Co., H., sweaters, and athletic goods	71 67	
Riley, E. C., secretary, contingent	2 30	
Remington Typewriter Co., The, typewriter	92 00	
Red Cross Co., The, chart, etc.	2 00	
Stephenson, R. S., rubbing	4 00	
Spalding & Bros., A. G., ladder	30 00	
Sunnyside Coal Co., coal	249 93	
Schmidt, Wm., hardware	65	
Sayle Mfg. Co., repairs	5 16	
Small & Stevens, tape, etc.	4 40	
Sumner & Morris, hardware	121 71	
Stephenson & Studemann, hdwe.	18 61	
Sumner & Son, Edw., drugs	93 80	
Tripp Co., The A. H., compound	2 25	
Ten Eyck, E. H., salary	909 96	
Taylor & Gleason, printing	57 00	
University pay roll, janitors, etc.	2,626 23	
University Co-op Co., mdse.	2,178 03	
U. S. Express Co., express	1 55	
Wisconsin Telephone Co., services, rentals	21 80	
Wolff, Kubly & Hirsig, hdwe.	3 48	
Western Union Telegraph Co., messages	2 00	
Weaver's Drug Store, drugs, etc	40 00	
Wiedenbeck, Dobelin & Co., hdwe.	31 76	
Walline, A., Mgr., services	11 25	
Yawkey-Crowley Lbr. Co., lumber	156 17	
Total		$39,899 65

GENERAL ACCOUNT

Atchison, Mrs. L., interest	$250 00	
Ames, A. R., condemnation proceedings	20 00	
Association of American Universities, assessment	50 00	
Angell, E. D., expenses	243 62	
Allen, C. E., expenses	37 05	
Administration pay roll, clerks, etc	5,205 80	
Alford Bros., laundry work	13 73	
American Crayon Co., crayons	9 25	
Albers, Wm., interest	550 00	
American Express Co., express	48 57	
Arion Orchestra, music	47 50	
Alumni Association, banquet	100 00	
Armour Glue Works, glue	36 00	

Buell & Lucas, condemnation proceedings, expenses	161 60	
Blied & Schneider, hardware	195 76	
Burger, Peter, hardware	49 68	
Bleyer, W. G., expenses	82 51	
Bernard & Son, C., services	25 40	
Black & Son, H. A., brooms	24 25	
Backhaus, L., rent of grader	2 00	
Bach, Hugo, music	455 00	
Bischoff, G. L., plastering	135 00	
Bailey, Banks & Biddle Co., diplomas	289 65	
Busse, A. C., drayage	10 00	
Beatty, A., expenses	10 81	
Badger Board, Badgers	150 00	
Brown, C. N., condemnation proceedings	40 00	
Capital City Green House, Plants	9 00	
Conklin & Sons, ice, fuel, cement, etc	176 80	
Cret, Paul P., expenses	87 85	
C. M. & St. P. Ry. Co., freight	46 32	
Comstock, J. P., hay	13 61	
Clow & Sons, J. B., apparatus	28 11	
Conklin, J., condemnation proceedings	30 00	
Cairns, W. B., expenses	29 96	
College Book Store, stationery	25	
Chronicle Co., The, advertising	17 75	
Cooley, C. F., cement, etc.	692 32	
Comstock, G. C., director and professor, salary	600 00	
C. & N. W. Ry. Co., freight	50 06	
Capital City Paper Co., paper	6 50	
Clark Engraving & Printing Co., plate	1 07	
Cantwell Printing Co., printing, etc	632 80	
Crane Co., pipe, etc	146 04	
City of Madison, water	2 00	
Democrat Printing Co., printing	441 00	
DePere Tablet Co., books	427 14	
Doyon & Rayne Lumber Co., lumber	161 60	
Diederich, M., mdse., groceries, etc	12 00	
Dengler, C. M., lettering	7 80	
Dowling, L. W., expenses	24 88	
Dane County Telephone Co., rentals, etc	15	
Dearborn, W. F., expenses	10 64	
Deane Steam Pump Co., pump	78 00	
Dickinson Co., A., seeds	54 38	
Diepold, P. J., repairs, etc	35 75	
Dennison Mfg. Co., tags, etc	3 66	
Dearborn Foundry Co., iron	6 16	
Dane County Title Co., abstracts	46 25	
Daily Cardinal, The, papers	250 00	
Elliott, E. C., expenses	32 64	
Evening Wisconsin Co., advertising	22 40	
Elliott Co., The, addressing machine	89 90	
Evans, M. B., expenses	30 47	
Ely, R. T., witness fees	5 00	
Electrical Supply Co., mdse	72 91	
Experiment Station, University of Minnesota, plants	26 05	
Felton, A. P., keys, locks, etc	7 90	
Frederickson, A. D. & J. V., lumber	398 89	
Fitch, W. D., embalming, etc	25 50	
Findorff, J. H., contracts, lumber	45 26	
Fay & Egan Co., J. A., tools	14 30	
Fehlandt, Wm., condemnation proceedings	30 00	
Foy, W., corn	10 77	
Fiske, G. C., expenses	28 10	
Gay, L., witness fees	13 50	
Grady, J. S., repairs	195 05	
Gardner Co., A. H., hose, etc	12 30	
Greig, J., furniture	10 50	
Gould, Wells & Blackburn Co., mdse	60 73	
Grimm's Bindery, binding	8 00	
Gilbertson & Anderson, repairs	7 25	
Gibson Soap Co., soap, etc	24 00	
Hoffman Feed Co., feed, oats, bran	146 00	
Halbach, J. P., harness, etc	49 75	
Holcomb Mfg. Co., J. I., brushes	22 80	
Hammersley, E. C., hay	19 61	
Haley, J. C., insurance	27 20	
Huels, F. W., keys, etc	8 00	
Hoffman, Wm., oats, bran, grain	196 51	

Hyland, W. J., lamp, etc	75	
Harper, R. A., expenses	3 95	
Haswell & Co., A., furniture	209 55	
Hoffmann Mfg. Co., B., tools	28 03	
Hoffmann & Baur, piping	18 00	
Hollister Drug Co., drugs, etc	31 55	
Hayes, J. D., shoeing	16 00	
Hennecke Co., C., wire	23 00	
Holzworth, C., blasting	73 35	
Hubbard, F. G., expenses	21 79	
Hinrich's Dry Goods Co., ribbon, mdse., towels	24 95	
Hammersley, Fay, hay	41 05	
Hoyt, F. W., witness fees	1 50	
International Harvester Co., repairs	7 69	
Ill. Malleable Iron Co., supplies	56 24	
Ill. Cent. Ry. Co., freight	25	
Ill. Elect. Co., wire, plates, etc	122 05	
Jackson, Drs. R. A. & J. A., services	200 00	
Jenkins, H. D., water color	60 00	
Journal Co., The, advertising	25 20	
Johns Manville Co., H. W., covering	92 01	
Kiefer-Haessler Hdw, Co., shelf rests	9 80	
Kimberly & Clark Co., paper	2,581 93	
Krausmann, Mrs. P., rent refunded	5 00	
Kroncke Bros., hardware	104 80	
King, F. H., interest	500 00	
Kailin & Son, M., brooms	3 00	
Keeley, Neckerman & Kessenich, mats, mdse	18 50	
Keyes, Wm., hauling	78 00	
Kittleson, I. E., expenses	21 00	
Koeppler, J., horses	325 00	
Larson, L. O., condemnation proceedings	30 67	
Ladd, W. B., condemnation proceedings	20 00	
Lamb, C. F., premium	5 00	
Lottes, W. G., salary	2 77	
Laird, W. P., fee, expenses, services	1,165 73	
Laird, A. G., expenses	16 92	
Library Bureau, cards, etc	112 00	
Loeb & Co., M., printing	16 96	
Loeb, Max, Gen. Sec'y Alumni Assn., salary	180 00	
Meyer, F. M., shoeing	55 60	
Meltzer, W. J., plumbing, repairing, etc	274 85	
Mutchler, I., car fare	14 00	
Metz, A., hose	12 00	
Mayers, A. A., mdse., glass, etc	75 43	
McConnell, A. W., expenses, fare	10 93	
McGowan, H. B., mat, rollers, dishes, brushes	12 15	
Madison Tent & Awning Co., rent of flags, covers, etc	7 00	
McKay, W. J., condemnation proceedings	30 00	
Mueller Co., The, heating plant	443 00	
Manning, Maxwell & Moore, tools	9 25	
Miller Lock Co., locks	1 60	
Madison Paint & Wall Paper Co., glass	2 00	
Madison General Hospital, hospital care and nurse	69 80	
Minch, H. J., feed	17 43	
McCarthy, T. C., contracting, etc	1,280 00	
Moseley, J. E., stationery	90	
Madison Gas & Electric Co., gas and current	147 35	
Munro, D. C., expenses	23 28	
Mautz Bros., paints, etc	243 58	
Morris, Riley & Dudgeon, condemnation proceedings	125 00	
Morris, W. A. P., witness fees	13 50	
Menges Pharmacy, drugs, etc	4 10	
Mandel Engraving Co., tracing	4 75	
Nielson, E. C., photo work	13 60	
Nicodemus, R. C., insurance premium	55 00	
National Blower Works, traps	17 50	
Norsman, O. S., witness fees	8 50	
Northern Paper Mills, paper	154 00	
Niedecken Co., H., envelopes	57 40	
Newbury & Peper, belting, pulleys, etc	9 38	
Northern Elect. Mfg. Co., motor, etc	6 00	
Oppel's Fancy Grocery, oil	24 00	
Orr & Lockett Hardware Co., fittings	41 43	
Owens, Wm., plumbing, etc	513 44	
Owen, Ray, drawing, map, drafting, etc	342 15	
Olson, J. E., editor university publication	200 00	

O'Shea, M. V., expenses	5 50	
Pierstorff, Wm., hay	16 59	
Philadelphia Casualty Co., premium	6 00	
Proctor, J. C., Agt., premium	42 00	
Parkinson-Marling Lumber Co., lumber	16 93	
Park & Saffle Co., stationery	69 35	
Postal Telegraph Co., messages	7 98	
Postmaster, Madison, postage	419 87	
Parsons Ptg. & Sta. Co., printing, etc	131 20	
Pitman Dry Goods Co., mdse	39 13	
Pickarts, L. J., bursar, postage, cash advanced, contingent	399 14	
Prescott Chem. Co., The, disinfectant	3 50	
Post Publishing Co., printing	2,970 93	
Phillips, J. D., engrossing, expenses	225 27	
Phillips & Son, H. A., truck	42 00	
Russell, H. L., witness fees	5 00	
Roley, M. S., condemnation proceedings	10 00	
Remington Typewriter Co., machine, keys, stand, etc	272 66	
Roeblings Sons Co., J. A., rope	3 48	
Riley, E. F., Sec'y, contingent	21 77	
Rapp, F. H., cleaning guns	27 00	
Reynolds, E. S., drayage	6 75	
Roe, F. W., expenses	23 23	
Raftree, W. P., hay	10 54	
Slaughter, M. S., expenses	60 11	
Smiley, B. E., tuning	50 00	
Stephens, D., brick, stone, etc	151 12	
Schmelzer, G., expenses	6 96	
Stevens, L. E., condemnation proceedings, witness fees	45 00	
Smith, C. F., expenses	6 70	
Sewell-Clapp Mfg. Co., envelopes	36 17	
Strellinger Co., C. A., oil, etc	8 64	
Swenson, Wm., condemnation proceedings	10 00	
Shaw, W. B., condemnation proceedings	30 00	
Stephenson & Studemann, hardware	6 90	
State Journal Printing Co., advertising, printing	226 16	
Stadard Machinery Co., machine part	3 75	
Skinner, E. B., expenses	44 28	
Sellery, G. C., expenses	28 58	
Stolen, Nels, hay	10 91	
Sentinel Co., The, advertising	10 80	
Sheldon, Dr. W. H., services	25 00	
Sumner & Morris, hardware	301 72	
Schwoegler & Bliss, plumbing	75	
Schlichter, C. S., expenses	17 37	
Sumner & Son, E., drugs	9 10	
Smith, J. A., premium	5 00	
Sheldon, Dr. C. S., services	42 50	
Small & Stevens, bicycle pump, etc	75	
Smith, H. A., expenses	26 74	
Sandsten, E. P., professor, salary	300 00	
Tressler, A. W., expenses	397 58	
Tenney, D. K., witness fees	13 50	
Tibbals, Jr., C. A., observations	77 50	
Taylor, R. F., witness fees	13 50	
Truax, Greene & Co., artificial limb	100 00	
Thorburn & Co., J. M., seeds	37 15	
Tracy, Gibbs & Co., printing	139 30	
Tension Envelope Co., envelopes	35 00	
Taylor & Gleason, printing	3 50	
University Cooperative Co., stationery	6 90	
United States Blue Print Co., prints, maps, etc	83 04	
University pay roll, janitors, etc	10,724 63	
United States Express Co., express	24 65	
Van Hise, C. R., maintenance of house	500 00	
Valvoline Oil Co., oil	2 50	
Vosen, G., horses	400 00	
Wehrmann, Chas., repairs, etc	68 65	
Wisconsin Telephone Co., rentals, etc	1,002 55	
Wright, S. G., directory	6 00	
Wisconsin Workshop for Blind, baskets	9 24	
Worth, Ed., hay	4 67	
Weber-Costello Co., crayon	15 00	
Wisconsin Literary Magazine, subscriptions	150 00	
Wiedenbeck, Dobelin & Co., hardware	10 65	
Western Electric Co., rubber, etc	82 84	
Wisconsin Wagon Co., repairs, etc	7 00	

Western Kieley Steam Spec. Co., valves, etc.	50 00	
Western Union Telegraph Co., messages	1 84	
Wolff, Kubly & Hirsig, hardware	53 09	
Yawkey-Crowley Lbr. Co., lumber	163 92	
Total		$45,021 61

WASHBURN OBSERVATORY

American Express Co., express	$5 01	
Administration pay roll, clerks, etc.	290 97	
Bradley Co., M., indexes	1 25	
Burger, Peter, hardware	30	
Blied & Schneider, hardware	1 60	
Bausch & Lomb Opt. Co., apparatus	13 50	
Conklin & Sons, fuel, coal, cement	331 66	
Crane Co., pipe, etc.	2 53	
City of Madison, water	13 50	
Comstock, G. C., director and professor, salary	3,000 00	
Diederich, M., mdse., groceries	3 15	
Dresen & Rhodes, painting, etc.	32 95	
Dane County Telephone Co., rental	12 00	
Frederickson, A. D. & J. V., lumber	36 27	
Flint, A. S., astronomer, salary	2,000 00	
Findorff, J. H., contracts	27 14	
Gaertner Co., Wm., repairs, mounting	8 75	
Greig, J., table	10 00	
Golsen, R. J., apparatus	2 91	
Goerz American Opt. Co., C. P., apparatus	44 45	
Kempf, J. J., premium	152 20	
Library Bureau, cards	1 13	
Menges Pharmacy, mdse., drugs, etc.	6 70	
Mayers, A. A., mdse.	2 69	
Mautz Bros., painting	48 05	
Madison Gas & Electric Co., gas and current	24 70	
Moseley, J. E., stationery	75	
Nelson & Polk, papering, etc.	160 00	
Owens, Wm., plumbing	235 00	
Park & Saffle Co., stationery	45	
Postmaster, Madison, postage	4 00	
Parsons Printing & Stationery Co., printing, etc.	82 33	
Pickarts, L. J., bursar, postage, cash advanced, bills paid	43 16	
Rand, McNally & Co., maps, etc.	22 50	
Taylor, Taylor & Hobson, magnifier	1 80	
United States Express Co., express	1 15	
University pay roll, janitors, etc.	665 51	
Western Electrical Co., mdse.	3 38	
Ward & Co., M., supplies	2 33	
Western Union Telegraph Co., messages	1 34	
Total		$7.262 12

CHADBOURNE HALL

Alford Bros., laundry	$2 75	
American Express Co., express	55	
Bell & Zoller Co., coal	3 45	
Baumbach-Reichel Co., ammonia	14 50	
Cork & Holt, rack	10 00	
Carterville Washed Coal Co., coal	68 24	
C. & N. W. Ry. Co., freight	7 30	
City of Madison, water	40 56	
Cooley, C. F., lime, coal, etc.	514 07	
Davy, Mrs. Mary, laundry	5 00	
Electrical Supply Co., mdse.	24 28	
Ender Coal & Coke Co., coal	113 22	
Fliegge, Emily, nurse	50 00	
Findorff, J. H., contracts	190 44	
Field & Co., Marshall, carpet, etc.	25 99	
Frederickson, A. D. & J. V., lumber	121 80	
Gardner Co., A. H., lacing	4 97	
Gould, Wells & Blackburn Co., mdse.	75	
Holcomb Mfg. Co., J. I., brushes	2 25	
Hoeveler, T., upholstering	6 00	
Huels, F. W., keys, etc.	20 52	
Hafer & Son Coal Co., H., coal	247 19	
Heat, light and water, percentages	3,113 54	
Illinois Central Ry. Co., freight, demurrage	1,447 91	

Johns-Manville Co., H. W., covering, etc	14 64	
Kroncke Bros., hardware	50	
Kempf, J. J., premium	304 41	
King & Walker Co., oven, etc	4 80	
Keeley, Neckerman & Kessenich, rug	21 00	
Keyes, Wm., hauling	239 23	
Lottes, W. G., instructor, salary	60	
Menges Pharmacy, drugs, etc	3 85	
Mayers, A. A., mdse	11 58	
Madison Gas & Electric Co., gas and current	2,075 46	
Mautz Bros., paints, etc	501 44	
Meyer, Jessie M., mistress, salary and covers	802 90	
Newbury & Peper, belting, etc	6 84	
Northern Electrical Mfg. Co., motor, etc	113 50	
O'Gara Coal Co., The, coal	141 71	
Owens, Wm., plumbing, etc	80 34	
Parsons Printing & Stationery Co., stationery and ptg	6 00	
Paltz, J., cleaning	39 70	
Pickarts, L. J., bursar, postage, cash advanced	4 00	
Riley, E. F., Secy., contingent	1 85	
Roeblings Sons Co., J. A., rope	8 74	
Schwoegler & Bliss, plumbing	2 00	
Sumner & Morris, hardware	9 56	
Schulze, Bertha, rent refund	5 15	
Sunnyside Coal Co., coal	132 32	
Strelow, H., dyeing	3 00	
Tobey Furniture Co., furniture	180 00	
University pay roll, janitors, etc	2,743 00	
Wolff, Kubly & Hirsig, hardware	2 55	
Total	- — —	$13,496 55

GENERAL LIBRARY

American Ceramic Society, books	$3 20	
American Society of Civil Engineers, catalog	5 25	
Accountency Pub. Co., subscription	4 00	
American Press Co., books	2 25	
Actuarial Society of America, subscription	5 25	
American Express Co., express	45 45	
American Political Science Association, dues	3 00	
American Civic Association, books	2 75	
American School of Home Economics, books	12 00	
Andrews, J. B., books	4 15	
American Medical Association, book	6 00	
American Society for Test. Materials, books	24 90	
Baer & Co., J., periodicals	2 34	
Baumgardt Publishing Co., book	1 92	
Brockhaus, F. A., books	458 56	
Bell & Zoller Co., coal	4 90	
Bureau of University Travel, prints	3 40	
Burke, L. C., library assistant, salary	1,000 00	
Boston Book Co., subscription, books	19 00	
Boyden, W. L., book	1 50	
Bowen, Agnes T., library assistant, salary	450 00	
Cantwell Printing Co., printing	5 00	
Collier & Son, P. F., books	21 70	
Cary, C. P., dictionary	7 50	
Cooley, C. F., coal	729 54	
Chicago Charter Convention, book	2 50	
Classical Association of Middle West and South, dues, books	4 00	
College Bookstore, stationery	7 75	
Carterville Washed Coal Co., coal	98 58	
Coddington, Hester, head cataloguer, salary	1,291 63	
C., M. & St. P. Ry. Co., freight	131 33	
C. & N. W. Ry. Co., freight	87 13	
Chandler, F., book	1 25	
Case, E. C., books	5 00	
Davison, Flora N., library assistant, salary	535 00	
Die Glocke, book	4 00	
Dowling, L. W., books	7 60	
Dixie Book Shop, books, periodicals	48 44	
Democrat Printing Co., printing, etc	4 40	
Dutton & Co., E. P., books	14 50	
Dudley, W. H., assistant librarian, salary	1,500 00	
Ender Coal & Coke Co., coal	163 54	

Electrical Supply Co., mdse	2 40	
Elliott Co., The, supplies	3 50	
Engineering Magazine, The, books, subscription	12 00	
Fock, G., books	5 26	
Frederickson, A. D. & J. V., lumber	13 50	
Grover, Arlene, library assistant, salary	770 00	
Gerhard, W. J., books	9 50	
Gillan & Co., S. Y., subscription	2 00	
Grimm's Book Bindery, binding	1,257 15	
Goodspeed's Book Shop, book	1 00	
Genthner, Paul, books	113 84	
Hunting Co., H. R., books	20 00	
Huels, F. W., keys, etc	15	
Houghton, Mifflin & Co., books	81 35	
Hafer & Son Coal Co., H., coal	357 07	
Healey, J. J., book	10 00	
Heffer & Sons, W., books	6 37	
Heat, light and water, percentages	4,639 22	
Illinois Central Ry. Co., freight, demurrage	2,132 04	
International Textbook Co., books	270 00	
Johnson Service Co., valves, etc	12 12	
Journal of Exp. Med., book	5 00	
Keramic Studio Pub. Co., books	13 50	
Keyes, Wm., hauling	347 51	
King & Walker Co., castings, etc	5 80	
Kroncke Bros., hardware	2 55	
Lemcke & Buechner, book	3 51	
Libbie & Co., C. F., books	44 71	
Library of Congress, cards	73 95	
Lord & Thomas, periodicals	2 40	
Rosenthal's Antiquariot, Ludwig, books	21 91	
Library Bureau, cards	13 20	
Lottes, W. G., instructor, salary	20	
Leonard, W. T., salary	180 00	
LeRoy, J. A., books	80 00	
Music Teachers' National Association, proceedings	1 60	
McClurg & Co., A. C., books	1,839 12	
M. O. Publishing Bureau, subscription	1 00	
Madison Gas & Electric Co., gas and current	1,291 15	
Miner, Sarah H., library assistant, salary	655 00	
Merwin-Clayton Sales Co., books	5 30	
Macmillan Co., The, bulletins	10 50	
Mautz Bros., paints, etc	1 00	
Menges Pharmacy, mdse., drugs, etc	1 89	
McCulloch, Isabella J., library assistant, salary	600 00	
New York Botanical Garden, books	6 00	
Norrena Society, The, books	24 50	
National German-American Teachers' Sem., subscription	3 00	
New England Botanical Club, periodical	10 50	
Neale Publishing Co., book	1 75	
O'Gara Coal Co., coal	212 47	
Picard & Fils Librarie, Alphons, book	1 22	
Palmer Co., The, periodicals	3 00	
Pierson, I. C., subscription	4 00	
Passavant, D. L., book	1 50	
Pickarts, L. J., bursar, postage, contingent, bills paid	84 11	
Parsons Printing & Sta. Co., printing and stationery	150 60	
Postmaster, Madison, postage	10 00	
Poor's Railroad Manual Co., book	10 00	
Pollard, C. L., books	14 25	
Remington Typewriter Co., machine, etc	305 50	
Rhoades, S. N., journal	2 40	
Religious Ed. Assn., dues	3 00	
Railway & Marine World, books	12 25	
Riley, E. F., Sec'y, contingent	3 58	
Railway Signal Association, books	4 00	
Rush, C. E., salary	45 00	
Sanford, Delia C., library assistant, salary	793 98	
Sumner & Morris, hardware	1 84	
System Co., The, books	2 00	
Sunnyside Coal Co., coal	191 13	
Skidmore, S., library assistant	240 00	
Salesmanship Co., The, books	4 70	
Sumner, H. L., books	5 19	
Stechert & Co., G. E., books	16,831 36	
Social Ed. Assn., book	2 00	
Schneider's News Depot, papers	8 85	
Sotheran & Co., H., books	49 93	

Swenson, C. F., library assistant, salary	445 00	
Standard Oil Co., oil	8 59	
Smith, W. M., librarian, salary, periodicals	2,503 00	
Smart, T. H., books	10 50	
Saltzstein, C., paper	2 50	
Smithsonian Institution, books, periodicals	85 40	
Sauvanaud, P., apparatus	28 72	
St. Louis Lumberman, book	3 00	
Schaefer, Ellen, library assistant, salary	375 00	
Thompson & Co., C. W., music	2 00	
Tilden, J. E., book	2 25	
University pay roll, janitors, etc	812 58	
University Press, The, subscription	29 00	
Union Library Association, book	10 00	
United States Express Co., express	26 87	
University of Chicago Press, publications, periodicals	17 78	
University Cooperative Co., stationery	4 65	
Usher, R. J., library assistant, salary	595 00	
University of Illinois, book	1 00	
Van Velzer, C. A., books	102 00	
Valvoline Oil Co., oil	2 00	
Western Union Telegraph Co., messages, etc	1 00	
Whitney, Helen G., library assistant, salary	440 00	
Wilson Co., H. W., subscription, periodicals, book	28 50	
Western Electrician Co., subscriptions	2 00	
Wildenmann, F., Sentinel	3 00	
Wegelin, O., book	2 06	
Wolff, Kubly & Hirsig, hardware	1 50	
Wilson Bulletin, The, book	3 00	
Wahr, Geo., guide	1 00	
Welter, H., books, periodicals	14 32	
Weilepp, Leila M., library assistant, salary	360 00	
Total		$46,692 31

LABORATORY SUPPLIES

American Society of Mechanical Engineers, books	$10 00	
American Entomological Co., labels, mdse	30 50	
Averbeck, F. A., watch	12 00	
Allis-Chalmers Co., valves and fittings	43 50	
Ashcroft Mfg. Co., The, repairs and apparatus	32 19	
American Express Co., express	314 76	
Alford Bros., laundry work	7 49	
American Electrochemical Society, books	4 00	
Armstrong Bros. Tool Co., tool holder	18 40	
Allen, A., embryos	10 00	
Atkins, W. A., formula	10 00	
Anderson, B. S., machinist	71 65	
Breese, Loomis & Co., muslin	1 60	
Baker & Co., inc., wire	31 96	
Bishop & Co., J., crucibles, dishes	85 92	
Bartholomew, E., botanical collection	6 00	
Bertuch & Co., F., filler	20 35	
Burger, Peter, hardware	6 75	
Besly & Co., C. H., hardware, glasses, etc	22 80	
Baker & Co., H., wire	6 96	
Burke & James, apparatus and supplies	11 22	
Burger & Co., R., apparatus, etc	63 64	
Blied & Co., F. C., printing	11 00	
British Oxygen Co., apparatus	103 68	
Bristol Co., The, ammeter	6 50	
Blackwelder, E., expenses	1 00	
Beatty, A., expenses, instruction	15 00	
Bentley, W. A., slides	20 70	
Blied & Schneider, hardware	49 28	
Bausch & Lomb Optical Co., apparatus, chemicals, etc	1,090 25	
Burdick & Murray Co., mdse	18 18	
Brockhaus, F. A., books	6 34	
Collins, F. S., fascicle	5 00	
Chicago Calcium Light Co., gas	79 50	
Central Scientific Co., racks	20 61	
C., M. & St. P. Ry. Co., freight	216 52	
Capital City Greenhouse, plants	17 25	
Clinton Wire Cloth Co., wire cloth	12 15	
Cleveland Stone Co., grindstone	13 53	
Chemical Engineering Publishing Co., publications	6 72	

Capital City Paper Co., paper, cutter	24 68	
Chicago Steel Tape Co., tapes	24 00	
Cutler-Hammer Mfg. Co., rheostat	180 00	
Cramer Dry Plate Co., chemicals, etc	28 97	
Crane Co., pipe, etc	23 73	
Crandall Packing Co., packing	8 81	
City of Madison, water	3 22	
Cantwell Printing Co., printing	24 55	
College Book Store, stationery, crayons	2 50	
Carpenter & Co., G. B., twine, tubing	18 04	
Crosby Steam Gage & Valve Co., cord, valves, etc	85 55	
Curtis Co., D., zinc	3 00	
Capital City Fuel Co., ice, coal	32 25	
Columbia Tool Steel Co., steel	135 43	
Conklin & Sons, ice, coal, lime, cement	149 20	
Conger, J. L., instruction	5 00	
Cambridge Scientific Inst. Co., The, insts	188 36	
C. & N. W. Ry. Co., freight	318 22	
Cooley, C. F., cement, lime	31 39	
Dennison Mfg. Co., labels	2 50	
Dreer, H. A., seeds	4 41	
Dunbar, F., slides	87 25	
Dilworth, J. T., instruction	10 00	
Duval, E. P. R., instruction	10 00	
Duvol Rubber Co., perfection dam	1 24	
Doyon & Rayne Lumber Co., lumber	12 27	
Dengler, C. M., lettering	60 45	
Downing's Foreign Express, express	11 51	
Dick & Co., A. B., stationery	7 30	
Dietzgen Co., Eugene, drawing materials, etc	158 39	
Democrat Printing Co., printing	91 69	
Diederich, M., groceries	59 21	
Driver-Harris Wire Co., wire	44 36	
Electrician Pub. Co., subscription	2 00	
Electrical World, subscription	6 00	
Eberbach & Son, jars	29 20	
Engineering Record, subscription	6 00	
Engelhard, Chas., drugs, apparatus	4 35	
Elliott Bros., condenser	68 09	
Eastern Chemical Co., plant food	5 50	
Engineering Magazine, books, subscription	7 00	
Electrical Supply Co., electric merchandise	107 91	
Eimer & Amend, chemicals, flasks	502 31	
Elec. Appliance Co., elec. mdse	70 81	
Engineering News Pub. Co., The, subscription	5 00	
French Battery Co., batteries	3 84	
Felton, A. P., locks, etc	2 00	
Findorff, J. H., lumber	12 72	
Fair Store, The, jars	4 05	
Foote Mineral Co., minerals, specimens	42 97	
Frost, W. D., instruction	10 00	
F. F. F. Laundry, laundry work	8 12	
Findlay & Co., groceries	93	
Fairbanks, Morse & Co., scales, rods, etc	18 86	
Ferro Machine & Foundry Co., fly-wheel	3 75	
Fauerbach Brewing Co., gas	24 00	
Fenneman, N. M., expenses	17 16	
Field & Co., Marshall, toweling	149 92	
Frederickson, A. D. & J. V., lumber	140 79	
Gormley, J. H., copy of thesis	5 83	
Gilbertson & Anderson, repairs	3 00	
Gurley, W. & L. E., vials	4 50	
General Chemical Co., acid	4 53	
Grasselli Chemical Co., The, chemicals	508 45	
Gould, Wells & Blackburn Co., mdse	27 98	
Gennert, G., photo app	15 46	
Gaertner & Co., Wm., clamps	12 96	
Green, H. J., thermometer	29 75	
General Electric Co., transformer, etc	28 59	
Gisholt Machine Co., castings, bronze, etc	26 73	
Griffith, E. M., instruction	7 50	
Gilman, S. W., instruction	10 00	
Grimes, N. C., instruction	5 50	
Goodell-Pratt Co., saws	5 47	
Grove's Sons, H., keg	1 25	
Gamm, W. J., repairing watches, etc	32 85	
Grimm's Book Bindery, binding	58 85	

Gross Hardware Co., P., rests, etc.	4 50	
Henion & Hubbell, hose	26 21	
Hunt, E. H., paper	1 20	
Heckemann, J., insurance	2 64	
Haak, Wm., lace, leather	4 48	
Hohlfeld, A. R., lectures	137 50	
Heil Chemical Co., Henry, chemicals	10,081 70	
Huels, F., locks, etc.	3 75	
Harloff, P. F., mdse.	53 91	
Haswell & Co., A., furniture	1 50	
Huber & Fuhrman, pepper	1 65	
Hoeveler, T., upholstering	1 50	
Hills, E. V., boxes	3 42	
Hinrichs Dry Goods Co., mdse.	32 26	
Hodge & Homer Co., blades	5 01	
Hollister Drug Co., bottles, chemicals, etc.	262 53	
Harris & Co., Samuel, brass, tubing, hardware, etc.	197 04	
Ingersoll-Rand Co., oil	4 75	
International Brass & Elec. Co., binding posts	11 25	
Ide & Sons, A. L., piston rod, etc.	8 65	
Illinois Glass Co., vials, jars, etc.	57 61	
Illinois Central Ry. Co., freight	91 01	
Illinois Paper Box Co., boxes and trays	26 16	
Illinois Electric Co., fans, insulators, etc.	128 62	
Imperial Brush Co., brushes, lathe	16 50	
Jaap, Otto, fungi	2 86	
Jastrow, Jos., lectures	135 00	
Johnson, G. H., files	1 02	
King & Walker Co., castings, fittings, etc.	286 89	
Kurz & Root, switch	1 80	
Kohl, Max, apparatus	385 40	
Kern & Co., rules	8 05	
Keeley, Neckerman & Kessenich, mdse.	4 88	
Keuffel & Esser Co., apparatus	69 40	
Kny-Scheerer Co., The, apparatus, skeleton	68 10	
Kroncke Bros., hardware	36 90	
Lentz & Sons, C., knives, etc.	7 85	
Loescher, G. A., hardware	2 53	
Lehn & Fink, specimens	6 37	
Lenoir & Forster, specimens	39 48	
Legler, H. E., lectures	365 60	
Lufkin Rule Co., tapes	6 75	
Lindemann & Hooverson Co., castings	25 75	
Leeds & Northrup Co., bronze strip, etc.	2 80	
Levitan, Sol., towels	3 60	
Lottes, W. G., salary	60 88	
Library Bureau, cards, etc.	24 20	
Leith, C. K., expenses	60 69	
Lorenz, M. O., instruction	30 00	
Leitz, Ernst, chemicals and apparatus	271 69	
Mountjoy, J. C., chart	12 50	
Madison Kipp Lubricator Co., rod	2 31	
Moseley, J. E., stationery	9 30	
Machado & Roller, repairs	5 60	
Moore & White Co., lever	1 00	
Mueller Co., The, pipe, etc.	8 37	
Matson & Klein, cloth	95	
Machinists' Supply Co., waste, clamps	24 39	
Midvale Mining & M. Co., carbanese	5 25	
Mineral Point Zinc Co., ore	6 00	
McLaughlin-Mateer Co., crushed stone	27 40	
McKinley Pub. Co., maps	4 39	
Madison Steam laundry, laundry work	16 82	
Minch, H. J., feed	34 55	
Marine Biological Laboratory, plants and specimens	47 95	
Madison Tent & Awning Co., awnings, etc.	75	
Milwaukee Leather Belting Co., belting	5 67	
Mihell & Co., F., waste	27 43	
Moore Corporation, J. C., stationery	6 00	
McConochie, L. G., instruction	10 00	
Menges Pharmacy, drugs, acid, tubing	98 60	
Mayers, A. A., mdse.	18 23	
Mautz Bros., paints, etc.	62 80	
McClurg & Co., A. C., books	67 20	
Madison Gas & Electric Co., gas and current	803 35	
National Distilling Co., alcohol	263 84	
Northwestern Expanded Metal Co., metal	9 78	

National Carbon Co., dry cells	4 56	
Nicholas, F. C., agent, freight	1 50	
Nichols Co., The, baskets	6 90	
Norton Co., emery wheel	5 63	
Northern Elec. Mfg. Co., brass, motor, etc	13 65	
Neostyle Co., apparatus	20 50	
Nielson, Alex., necturns	2 40	
Nelson & Polk Co., paints	6 75	
Nielson, E. C., slides, etc	3 50	
Newbury & Peper, pulley, belting, etc	71 13	
Nernst Lamp Co., glowers	28 38	
Olwell Bros., glasses	1 50	
Orr & Lockett Hdwe. Co., hardware	12 62	
Otto, M., instruction	2 50	
O'Shea, M. V., instruction	5 00	
Owens, Wm., plumbing	46 83	
Olsen & Co., T., needles	5 00	
Obermeyer Co., S., ladles, crucibles	9 59	
Patterson & Co., L., boxes	25 50	
Parke, Davis & Co., toxin, etc	1 40	
Pratt & Whitney Co., taps	7 47	
Philadelphia Gear Works, wheels	1 70	
Parker, W. C., copy of thesis	3 67	
Peterson & Co., L., boxes	7 50	
Piper Bros., matches, etc	4 15	
Petitdidier, O. L., mirrors	10 00	
Plant Study Co., The, specimens	8 10	
Pleh, J. F., sand	7 90	
Pitman Dry Goods Co., mdse	23 37	
Park & Saffle Co., stationery	8 60	
Pritzlaff Hdwe. Co., J., hatchets, zinc, etc	16 19	
Parsons Printing & Sta. Co., printing, etc	28 60	
Prokosch, E., instruction	15 00	
Pickarts, L. J., bursar, postage, bills paid	26 05	
Riehle Bros. Testing Machine Co., tool	2 00	
Reynolds, E. S., draying	18 50	
Root & Co., A. I., bee-hive	6 00	
Rath, W. C., moulds	3 50	
Reynolds, J. B., chickens	1 50	
Rich, F. A., Agent, disk	40 00	
Riley, E. F., Secy., contingent	24 31	
Russell, H. L., instruction	27 50	
Roessler & Hasslacher Chem. Co., acid	64 79	
Rangoni, U., apparatus	8 64	
Stephens, H. M., specimens	8 85	
Small & Stevens, bicycle pump, etc	1 50	
Schapirograph Co., The, schapirograph	8 00	
Schulz Co., Geo. A., trays	15 00	
Steel Supply Co., The, steel	1 88	
Sparling, S. E., lectures	27 50	
Smith, C. C., cards, etc	14 41	
Schoelkopf, L. F., pump, etc	7 00	
Street Railway Journal, subscription	6 50	
Seed Dry Plate Co., M. A., photo supplies	13 44	
Stocker Machine Co., H. A., emery wheel	12 83	
Smith, L. S., expenses	160 21	
Sholes Co., C. E., carbonate, acid	15 50	
Spencer Lens Co., apparatus	53 25	
Standard Oil Co., oil and wax	34 76	
Sweet, Wallach & Co., photo supplies	52 10	
Sinaiko Bros., belting	25 00	
Schroeder, F. C., drafting	6 50	
Stephenson & Studemann, hdwe	48 42	
Stoelting Co., C. H., apparatus and supplies	47 70	
Sears, Roebuck & Co., supplies	11 49	
Sandsten, E. P., instruction	55 00	
Sheldon Co., G. W., apparatus	18 61	
Scheler, H., meats, etc	6 10	
Showerman, G., lectures	240 91	
Snyder, M. L., mimeograph work	6 80	
Smith, E. R., instruction	7 50	
Schaeffer & Budenberg Mfg. Co., diaphragms, etc	15 66	
Scientific Shop, The, thermometers	6 00	
Schuchardt, Dr. Theodore, chemicals	9 65	
Schultz & Knabe, sand	3 25	
Strelinger Co., C. A., apparatus	16 40	
Sumner & Morris, hardware	229 17	

Sphung, A. A., frogs	30 00	
State Journal Printing Co., printing	7 50	
Sargent & Co., E. H., chemicals, etc	1,698 24	
Steeg & Reuter, apparatus	55 99	
Steinheil Soehne, C. A., lenses	26 98	
Stechert & Co., G. E., books	949 30	
Tomlinson, W. H., rock sections	41 20	
Taylor & Gleason, printing	29 25	
Thwaites, R. G., lectures	110 00	
Tracy, Gibbs & Co., printing	24 80	
Thorburn & Co., J. M., seeds	25 18	
Truax, Green & Co., skeleton	43 00	
Tight Joint Co., fittings	9 30	
Thompson-Houston Elec. Co., castings	9 60	
University of Chicago Press, reprints, periodicals	11 60	
U. S. Express Co., express	61 11	
University Co-op Co., mdse	125 01	
University pay roll, labor, etc	2,831 69	
Vance, Jr., J., necturns	2 70	
Vaas-Maw Dry Goods Co., belting	1 08	
Vaughan's Seed Store, seeds, oil	2 90	
Van Schaack & Sons, sponges	42 98	
Viscosity Oil Co., oil	220 13	
Veeder Mfg. Co., instrument	1 00	
Valvoline Oil Co., oil	42 41	
Wisconsin Telephone Co., rentals	4 20	
Ward & Co., M., tumblers, etc	5 95	
Williams & Peters, coal	231 98	
Wisconsin Malleable Iron Co., tensions	45 75	
Westinghouse Elec. & Mfg. Co., wattmeter, etc	19 50	
Wissler Inst. Works, vial	4 00	
Wagner, Geo., crayfish	1 75	
Wisconsin Music Co., strings, etc.	2 50	
Wolff, H. C., correspondence, instruction	25 00	
Wood, K. T., rubber dam	3 00	
Western Elec. Co., mdse	15 83	
Wadhams Oil Co., waste	20 90	
Warner, W. W., record, mdse	5 70	
Watertown Thermom. Co., thermometers	43 20	
Whitall, Tatum Co., tubing, corks	30 75	
Wisconsin Engineer, The, advertising	22 45	
Whitcomb, R. C., delivering	8 40	
Ward's Natural Science Establishment, chart	2 25	
William's Pharmacy, drugs	17 45	
Weston Elec. Inst. Co., instruments, etc	32 43	
Wooley, E. C., instruction	10 00	
White Dental Mfg. Co., S. S., oxygen, gas	30 05	
Wilson Co., The, periodicals, etc	4 50	
Wiedenbeck, Dobelin & Co., hardware	431 20	
Williams, Browne & Earle, strips, glass	5 25	
Western Union Telegraph Co., messages	6 79	
Wolff, Kubly & Hirsig, hardware	91 38	
Yawkey-Crowley Lbr. Co	362 15	
Zeiss, Carl, microscope	91 50	
Total		$30,812 59

FIRE PROTECTION

Anderson, B. S., salary	$7 60	
American Express Co., express	2 25	
Burger, P., hardware	1 50	
Blied & Schneider, hardware	60	
Clow & Sons, J. B., fittings, etc	41 51	
C. & N. W. Ry. Co., freight	25	
C. M. & St. P. Ry. Co., freight	4 54	
Democrat Printing Co., printing	6 80	
Diederich, M., mdse	3 40	
Elligan, H., contract	40 83	
Electrical Supply Co., mdse	80 94	
Gross Hdwe. Co., P., locks	36 00	
King & Walker Co., castings	14 76	
Ludlow Valve Co., valves, etc	31 38	
Milwaukee Leather Belting Co., gaskets	5 29	
Mayers, A. A., mdse.	41 96	
McCarthy, T. C., platforms, etc	303 95	
Mitchell, J. W., hose houses	360 00	

Owens, Wm., plumbing	9 35	....
Raymond Lead Co., lead	20 55	....
Sumner & Morris, hardware	3 07	....
Salisbury & Co., W. H., hose	180 00	....
University pay roll, janitors, etc.	283 25	....
Wiedenbeck, Dobelin & Co., hardware	11 06	....
Total		$1,502 84

UNIVERSITY EXTENSION

American Express Co., express	4 00	....
Administration pay roll, clerks, etc.	569 91	....
Burchell, D. E., expenses	23 34	....
C. & N. W. Ry. Co., freight	31	....
C. M. & St. P. Ry. Co., freight	27	....
Cantwell Printing Co., printing, etc.	15 60	....
Democrat Printing Co., printing	7 08	....
Elliott, E. C., expenses	17 47	....
Flisch, Julia A., salary, expenses	63 67	....
Haswell & Co., furniture	12 17	....
Hutchins, F. A., salary and expenses	1,401 57	....
International Textbook Co., phonograph	102 00	....
Klein Bros., sign, etc.	4 75	....
Lighty, W. H., salary and expenses	1,239 80	....
Loeb & Co., Max, printing	26 25	....
McCarthy, Chas., expenses	35 25	....
Nielson, E. C., photo work	6 50	....
Park & Saffle Co., stationery	20 05	....
Parsons P. & S. Co., stationery and printing	29 60	....
Postmaster, Madison, postage	83 60	....
Pickarts, L. J., bursar, postage and cash advanced	503 00	....
Remington Typewriter Co., machine, etc.	92 75	....
Riley, E. F., Secy., contingent	45	....
Shaw-Walker Co., cards	26 09	....
Sewell-Clapp, Mfg. Co., envelopes	10 05	....
Smith-Premier Typewriter Co., machine	74 00	....
State Journal Printing Co., printing	5 25	....
Tracy, Gibbs & Co., printing, etc.	435 10	....
U. S., Express Co., express	6 28	....
U. S. School of languages, express	1 05	....
Van Hoesen Co., H. M., letter heads	5 00	....
Wisconsin Telephone Co., rentals	25	....
Western Union Telegraph Co., message	27	....
Total		$4,828 73

CHEMICAL EQUIPMENT

Administration pay roll, clerks, etc.	62 50	....
Eimer & Amend, chemicals	100 00	....
Henry Heil Chem. Co., chemicals	37 60	....
King & Walker Co., castings, etc.	7 26	....
Kny-Scheerer Co., combustion furnaces	144 54	....
Owens, Wm., plumbing	12 08	....
Sumner & Morris, hdwe.	54 70	....
Thomas Co., A. H., balances	436 00	....
University pay roll, janitors, etc.	4 10	....
Wiedenbeck, Dobelin & Co., hdwe	35 75	....
Whitall, Tatum Co., bottles, moulds, etc.	445 43	....
Total		$1,339 96

NEW CENTRAL PLANT

Administration pay roll, clerks, etc.	$528 93	....
Bull, Storm, expenses	60 33	....
Cantwell Printing Co., printing	1 00	....
Free Press Co., advertising	25 20	....
Haak, Jr., Wm., drilling	65 00	....
Sentinel Co., advertising	16 80	....
State Journal Printing Co., printing	6 75	....
University Co-op Co., mdse.	21 60	....
University pay roll, janitors, etc.	4 95	....
Western Union Telegraph Co., messages	25	....
Total		$730 81

UNIVERSITY HALL—NORTH WING

Administration pay roll, clerks, etc	$121 57	
Burger, P., hdwe	1 50	
Crane Co., pipe and fittings	452 46	
C. & N. W. Ry. Co., freight	14 26	
Democrat Printing Co., printing	1 75	
Doescher, J., repairing clock	16 00	
Electrical Supply Co., mdse	13 84	
Findorff, J. H., contract	75 00	
Gross Hdwe. Co., P., hdwe	31 95	
McCarthy, T. C., construction, cut stone	51,200 00	
Peabody, Arthur, expenses	15 00	
Paulus Hdwe. Co., Peter, hdwe	32 12	
State Insurance Funds, transfer of premium	19 39	
University pay roll, janitors, etc	222 98	
Western Electric Co., mdse	23 35	
Wolff, Kubly & Hirsig, hdwe	2 15	
Total		$52,243 30

AGRICULTURAL ENGINEERING BUILDING

Administration pay roll, clerks, etc	$218 50	
American Express Co., express	1 03	
American Contractor, advertising	14 53	
Cooley, C. F., cement, etc	1 25	
Crosby Steam Gage Co., gages, etc	23 25	
Chronicle Co., advertising	14 63	
Clow & Sons, Jas. B., fittings, etc	4 01	
Crane Co., pipe and fittings	337 21	
C. & N. W. Ry. Co., freight	22 32	
C. M. & St. P. Ry. Co., freight	14 33	
Democrat Printing Co., printing	6 36	
Diederich, M., groceries	50	
Doyon & Rayne Lbr. Co., lumber	3 81	
Deane Steam Pump Co., pump, repairs, etc	199 00	
Gazette Printing Co., advertising	6 80	
Gormley, J. H., services	50 00	
Heil Co., The, tank	60 63	
Illinois Central Railway Co., freight	95	
Johns-Manville Co., H. W., covering, etc	91 57	
Kieffer-Haessler Hdwe. Co., hdwe	395 00	
Mautz Bros., paints, etc	90	
Mayers, A. A., drugs, etc	12 25	
McCarthy, T. C., contract	31,142 00	
Milwaukee Free Press, advertising	39 90	
National Blower Works, traps	93 75	
Park & Saffle Co., stationery	1 10	
Post Publishing Co., printing	3 80	
Riley, E. F., secretary, contingent	50	
Reynolds, E. S., drayage	8 63	
State Journal Co., printing	3 30	
State Insurance Fund, transfer of premium	11 01	
University Co-op Co., stationery	20 10	
U. S. Cast Iron Pipe Co., pipe and fittings	241 31	
University pay roll, janitors, etc	935 41	
Wisconsin Telephone Co., messages	35	
Wiedenbeck, Dobelin Co., hdwe	15 28	
Wood & Co., R. D., hydrants, valves, etc	70 25	
Western Kieley Steam Specialty Co	112 73	
Total		$31,220 32

AGRONOMY BUILDING

American Express Co., express	$1 02	
American Contractor, advertising	14 50	
Administration pay roll, clerks, etc	217 50	
C. M. & St. P. Ry. Co., freight	14 33	
Chronicle Co., advertising	14 62	
Cooley, C. F., cement, etc	1 25	
Crosby Steam Gage Co., gages, etc	23 25	
Clow & Sons, Jas. B., fittings, etc	4 02	
City of Madison, water	19 50	
Crane Co., pipe and fittings	358 47	
C. & N. W. Ry. Co., freight	19 60	

Democrat Printing Co., printing	6 39	
Diederich, M., groceries	50	
Deane Steam Pump Co., pump and repairs	193 00	
Electrical Supply Co., mdse	59 54	
Gazette Printing Co., advertising	6 80	
Gross Hdwe. Co., P., contract	450 00	
Heil Co., The, tank	60 62	
Illinois Central Ry. Co., freight	95	
Illinois Elec. Co., mdse	112 78	
Johns-Manville Co., H. W., covering, cement, etc	94 56	
Milwaukee Free Press, advertising	30 90	
Mayers, A. A., drugs, mdse	12 25	
McCarthy, T. C., contract	25,808 00	
National Blower Works, traps	93 75	
Post Publishing Co., printing	3 80	
Riley, E. F., Secy., contingent	50	
Reynolds, E. S., drayage	8 62	
State Insurance Fund, transfer of premium	11 02	
U. S. Cast Iron Pipe Co., pipe and fittings	241 31	
University pay roll, labor, etc	824 05	
Western Kieley Steam Specialty Co., valves, etc	112 72	
Wood & Co., R. D., hydrants, valves, etc	70 25	
Total		$28,905 37

J. J. HILL RAILWAY LIBRARY FUND

American Express Co., express	$14 40	
Burnham Antique Book Store, books	2 00	
Carleton, Mrs. E. N., books	1 85	
DeWitt & Snelling, books	32 60	
Dixie Bookshop, books	143 00	
Freight Pub. Co., books	11 90	
Grimm's Bindery, binding	9 70	
Havens Co., R. R., books	2 50	
Hart, J., book	2 50	
Levi, E. E., book	1 55	
Morris, F. W., books	2 82	
McClurg & Co., A. C., books	51 04	
National Railway Pub. Co., periodicals	63 50	
Publishers' Weekly, books	11 20	
Richardson, T. E., pamphlets	200 00	
Ried, C. D., books	121 55	
Riley, E. F., Secy., contingent	75	
Stechert Co., G. E., books	370 08	
Seabrook, J. D., books	26 58	
Taylor, T. J., books	104 90	
U. S. Express Co., express	6 17	
Usher, R. J., books, labor	309 17	
Total		$1,489 85

FEES REFUNDED

Andrus, W. C	$17 00	
Allen, P. J	16 00	
Armstrong, H. C	8 80	
Bundy, R. G	9 60	
Baker, A. G	8 80	
Bucher, H	20 00	
Bartlett, C. L	3 00	
Breitenbach, O. H	25 00	
Brown, E. S	20 00	
Blatz, G. A	10 00	
Birkett, M. W	10 00	
Bell, E. A	15 00	
Bantleon, F. D	17 00	
Bates, F. E	20 00	
Budd, H. L	20 00	
Birchard, R. R	36 00	
Ball, T. L	4 40	
Batty, G. M	3 00	
Becker, K.	1 25	
Baskerville, D.	4 00	
Blair, M. J	16 00	
Cline, L. E	15 00	
Cunningham, F. F	11 00	

Coerper, F.	6 00	
Cunningham, J. W	10 00	
Clark, C. R	10 00	
Cady, E. C	11 00	
Crocker, A. G	20 00	
Cullen, E. A	12 00	
Crowell, G. G	9 00	
Coggwell, C. D	10 00	
Disque, R. C	20 00	
Dahl, E.	2 25	
Davison, A. K	9 00	
Dean, C. E	8 80	
Davis, W. L	12 00	
Egelhoff, R. E	10 00	
Eggum, O. J	25 00	
Edwards, B. V	21 60	
Elwell, F. H	15 00	
Fuller, C.	20 00	
Forbes, R. H	7 00	
Foiles, E. L	15 00	
Farnham, F. F	20 00	
Gilman, Jr., S	3 20	
Gascoigne, F.	10 00	
Groff, B. H	20 00	
Grace, Jr., H. H	3 00	
Goodnow, F.	3 00	
Green, E. G	15 00	
Gage, H.	25 00	
Hopkins, R. E	15 00	
Hamilton, W. L	15 00	
Hill, C. N	10 00	
Hoard, G.	4 00	
Holmes, H. M	20 00	
Hobbins, F.	10 00	
Holty, M. N	2 20	
Hueffner, M. M	25 00	
Hopson, H. C	10 00	
Hefty, T. R	10 00	
Heinz, A.	10 00	
Hale, E. L	6 40	
Harper, H. M	20 00	
Hetzel, R. D	25 00	
Hurlbut, R. B	15 00	
Hedges, C. F	16 00	
Ingals, F. E	20 00	
Ives, A. L	6 00	
Iles, I. V	15 00	
Johnson, J.	11 00	
Johnson, A. A	10 00	
Jackson, W. B	25 00	
Jones, K. V	20 00	
Jelle, N.	5 75	
Jacque, P. N	11 00	
Jonas, H.	4 40	
Johnson, C. E	4 40	
Jaeck, E. G	8 80	
Jamieson, B.	11 00	
Kadish, V. H	4 40	
Kelley, W.	6 00	
Kennedy, F. M	10 00	
Knapp, P. M	6 00	
Knudson, H. M	3 00	
Kitchell, G.	1 00	
Kellar, M. V	10 00	
Kressin, A.	15 00	
Lamphere, H. L	8 80	
Lauerman, A. W	15 00	
Lowman, M. B	15 00	
Larson, L. T	15 00	
Murray, R.	21 00	
Mercein, C. S	10 00	
Morgan, J. J	25 00	
Macartney, M.	14 00	
McConochie, G. S	25 00	
Malone, E. S	6 00	
Miller, W. C	10 00	
Minier, E.	30 50	
Morrell, I. G	8 00	

Mendez, A. E.	26 00	
Mulcahy, M. J.	38 50	
Murphy, P.	1 00	
Marshall, E.	15 00	
Moser, H. D.	11 00	
Nelson, R. S.	8 80	
Neeves, H. W.	6 60	
Norton, S. E.	10 00	
Notz, W. T.	1 00	
Nicholson, D. C.	10 00	
Nebel, L. H.	16 00	
Olin, M. E.	10 00	
Osgood, C.	20 00	
Peck, O. K.	20 00	
Proctor, E. B.	4 00	
Putnam, M. M.	8 00	
Purcell, F.	1 00	
Parker, F. A.	10 00	
Porter, W. N.	16 00	
Pratt, H. K.	15 00	
Penwell, E. D.	26 00	
Price, G. W.	36 00	
Rheem, G. S.	20 80	
Rawlings, W. E.	10 00	
Richardson, J.	20 00	
Robertson, A. H.	15 00	
Rightor, C. E.	15 00	
Richardson, H. H.	13 60	
Rosenthal, A. B.	2 20	
Roycroft, E.	1 50	
Smith, L. L.	15 00	
Sumney, A. T.	15 60	
Schroeder, W. C.	1 00	
Steenrod, T. F.	20 00	
Staehle, P. M.	6 00	
Shaffer, G. B.	20 00	
Stephens, H. B.	10 00	
Schwenker, P. F.	10 00	
Schindler, J. G.	15 00	
Stephan, C.	4 00	
Stedman, C. A.	20 40	
Schoelkopf, W. H.	14 40	
Schulte, W. B.	20 00	
Stroud, P. C.	37 50	
Siebecker, K. L.	20 00	
Schultz, E. W.	1 00	
Spande, T. J.	2 20	
Shaffer, G. B.	7 00	
Simon, E. M.	20 00	
Stromme, A.	6 00	
Segerson, H. N.	15 00	
Schmidt, F. C.	15 00	
Twesme, A. T.	25 00	
Towle, L. N.	15 00	
Thomas, M. E.	25 00	
Telfer, C. J.	11 00	
Thompson, A.	5 75	
Taylor, F. W.	12 00	
Underwood, W. S.	10 00	
Vaughan, J. P.	15 00	
Vreeland, B. G.	26 00	
Wied, E.	15 00	
Whitelaw, M. R.	10 00	
Weed, L. B.	6 00	
Weber, W. H.	16 00	
Wilson, Mrs. C. M.	6 00	
Williams, E. R.	10 00	
Williams, F. E.	10 00	
Wadsworth, N. J.	20 00	
Willett, G. H.	15 00	
Wellensgard, J. A.	4 40	
Webber, J. M.	10 00	
Whittier, J. R.	15 00	
Wieboldt, R. C.	35 00	
Yager, R. N.	20 00	
		$2,328 60

NORTH WING EQUIPMENT

Andrews Co., A. H., furniture, contract	$5,357 25	
Administration pay roll, clerks, etc	172 50	
American Express Co., express	1 50	
Blied & Schneider, hardware	12 50	
C. & N. W. Ry. Co., freight	35 82	
C., M. & St. P. Ry Co., freight	45 81	
Dengler, C. M., lettering	15 63	
Electrical Supply Co., mdse	32 55	
Findorff, J. H., contract, windows	228 75	
Field & Co., M., laying carpet, carpet	623 05	
Frederickson, A. D. & J. V., lumber	450 56	
Haswell & Co., A., furniture	158 82	
Illinois Electric Co., mdse	431 51	
Kroncke Bros., hardware	17 93	
Klein Bros., paints, etc	2 00	
Mayers, A. A., drugs, etc., mdse	10 42	
McCarthy, T. C., contract	121 00	
Madison Gas & Electric Co., gas and current	160 00	
Mautz Bros., paints, etc	507 92	
Newbury & Peper, belting, etc	4 19	
Owens, Wm., plumbing	115 88	
Pickarts, L. J., bursar, contingent	15	
Park & Saffle Co., stationery	8 50	
Postal Telegraph Co., message	37	
Sumner & Morris, hardware	64 38	
Tracy, Gibbs & Co., printing	163 50	
University pay roll, janitors, etc	772 35	
Wolff, Kubly & Hirsig, hardware	3 35	
Yawkey-Crowley Lumber Co., lumber	164 72	
Total		$9,691 99

TROSTEL PRIZE FUND

Bunde & Upmeyer, charms		$80 00

UNIVERSITY GROUNDS

Buell & Lucas, legal services	$350 00	
Gratz, A. W., land	2,800 00	
Jones & Schubring, Bashford, etc., Corry proceedings	125 00	
King, F. H., note and interest	4,047 75	
Larson, L. O., Corry proceedings	28,995 36	
Total		$36,318 11

HENRY GUND SCHOLARSHIP

Newport, Clara P., aid		$250 00

F. W. ALLIS SCHOLARSHIP

Whyte, J., aid		$200 00

VOGEL FELLOWSHIP

Osgood, E. J., aid		$280 00

KLETZSCH FELLOWSHIP FUND

Darling, F. E., rabbit	$6 00	
Utzerath, Wm., machine	11 00	
Pickarts, L. J., bursar, bills paid	6 00	
Total		$23 00

PIANO ACCOUNT

McRae, M. E., refund	$5 00	
Northern Electric Mfg. Co., repairs	30 50	
Olin, M. E., refund	3 00	
Postal Telegraph Co., message	25	
Pickarts, L. J., bursar, refund	3 00	
Smiley, B. E., repairs	105 00	
Wisconsin Music Co., piano	250 00	
Total		$396 75

AGRONOMY BUILDING EQUIPMENT

C. & N. W. Ry. Co., freight	$1 16	
Electrical Supply Co., mdse	9 69	
Total		$10 85

AGRICULTURAL ENGINEERING BUILDING EQUIPMENT

Electrical Supply Co., mdse		$9 68

CREAM CITY PRIZE

Robinson, E. E., prize in oratory		$100 00

STEENSLAND PRIZE

Frost, R. B., prize	$20 00	
Gruhl, E. F., prize	10 00	
Hill, C. N., first prize	40 00	
Total		$70 00

DETAIL OF DISBURSEMENTS, 1907-1908.

AGRICULTURAL COLLEGE AND EXPERIMENT STATION.

American Guernsey Cattle Club, certificates, fees, etc	$112 56	
Administration pay roll, clerks, etc	1,972 41	
American Clydesdale Association, registration	12 00	
Agricultural College pay roll, clerks, etc	40,520 23	
Alexander, A. S., professor, salary, expenses	2,702 50	
American Chester-White Record Association, registration	1 00	
American Southdown Breeders' Association, entries, fee	15 25	
Association of American Agricultural Colleges and Experiment Stations, fee	15 00	
American Entomological Co., mounts	5 10	
American Plow Co., oil —	2 00	
American Jersey Cattle Club, entries	22 25	
American Duroc-Jersey Swine Breeders' Association, book, registration	20 50	
Agricultural College Institute pay roll, instructors	5,092 67	
Ayrshire Breeders' Association, recording	6 00	
American Shropshire Association, registration	6 25	
Atwood, J. B., & Sons, pig	50 00	
American Poland-China Record, registration	13 00	
Andrew, J. M., expenses	127 77	
Andrews, A. H., Co., castings, etc	4 40	
American Cheviot Sheep Society, registration	4 50	
American Injector Co., repairs	8 15	
Accola, J., expenses	14 52	
Allen, G., lamb	10 00	
Ashland Cedar and Fuel Co., posts	1 90	
American Breeders' Association, book	1 00	
Alpha Creamery Co., express, etc	3 90	
American Trotting Register Association, registration	5 00	
American Berkshire Association, fees	36 25	
American Suffolk Horse Association, book	2 50	
American Yorkshire Club, certificate	5 00	
American Tamworth Swine Association, registration	5 20	
American Wire Fence Co., fence	23 04	
Alford Bros., laundry	24 23	
American Express Co., express	241 36	
Babbitt, B. T., lye	32 00	
Broughton, A., lambs	54 00	
Boston Thermometer Co., case	6 50	
Barbee Wire & Iron Works, cloth	1 50	
Block, W. R., salary	225 00	
Burdick & Murray Co., toweling, batting	27 00	
Burnett Lumber Co., lumber	2 95	
Burroughs Adding Machine Co., stand, etc	6 00	
Besly, C. H., & Co., hardware	82	
Buell, Ira M., seed	1 50	
Barnum, S. H., stands	17 00	
Butcher Folding Crate Co., crates	30 34	
Brown, H. H., case	5 00	
Bishop, J., & Co., crucible	5 70	
Beattie & West, medical service	18 50	
Bogart, G., repairs	2 75	
Burpee, W. A., & Co., seeds	2 54	
Bruce, J. A., & Co., seeds	5 45	
Buckler, J., superintendent, refund	90 10	
Burrell, D. H., & Co., tools, metal	15 75	
Badger Box & Lumber Co., boxes	8 00	
Badger State Fruit Farm, plants	15 00	
Babcock, S. M., assistant director and professor, salary	3,000 00	
Bausch & Lomb Optical Co., chemicals, instruments, etc	1,597 70	
Butter & Cheese Scoring pay roll, butter and cheese	564 73	
Booth, A., & Co., freight, storage, etc	115 16	

Benkendorf, G. H., instructor, salary, expenses	1,375 21	
Brown, E. C., Co., valves, spray, etc	15 33	
Blied, F. C., & Co., printing	93 30	
Burger, Peter, hardware	266 38	
Barber, A. H., Creamery Supply Co., butter color, triers, etc.	257 30	
Blied & Schneider, hardware, keys, etc	36 50	
Brockhaus, F. A., books	332 60	
Challoner & Co., inspection	22 58	
Cudahy Packing Co., soda	7 00	
Cutler-Hammer Mfg. Co., starter, etc	4 80	
Combs, E. E., picture	1 75	
Childs, C. H., & Co., sprayer, chemicals	4 75	
Conover, C. E., paper	15 50	
Cain, E. C., repairs	8 00	
Clow, J. B., & Sons, motor, fittings, pipe, etc	51 54	
College Book Store, pictures, stationery	22 75	
Carman, C., shoeing	48 30	
Chester, E. E., & Son, seed	12 00	
Carter-Crume Co., paper	45 00	
Centralia Hardware Co., tools, pipe, hardware	39 48	
Cranmoor Telephone Co., rental	18 25	
Cary, C. P., superintendent, dictionary	15 00	
Cook & Brown Lime Co., tile	96 21	
Campbell, W. E., use of horses	3 00	
Chapin & Co., flakes	97 28	
Creamery pay roll, milk and cream	61,185 15	
Currie Bros., seeds, bushes	35 46	
City of Madison, water	15 28	
Chicago Flexible Shaft Co., pull	18 00	
Coe, Converse & Edwards Co., plants	14 00	
Cornish, Curtis & Greene Co., churn, supplies, etc	72 31	
Chicago Architectural Photo Co., slides	4 80	
Cadwell, H. W., guinea pigs	20 00	
Capital City Paper Co., paper, etc	72 39	
Creamery Package Mfg. Co., cans, supplies, apparatus, etc.	539 93	
Conklin & Sons, ice, cement, coal	442 71	
Crane Co., pipe, gages, fittings, etc	268 34	
Chandler, S. S., potatoes, lease, photo work, seed	193 57	
Castle & Doyle, coal, cement, lime	5,760 12	
Cooley, C. F., cement, coal, granite, lime, coke	1,497 57	
C., M. & St. P. Ry. Co., freight	486 91	
C. & N. W. Ry. Co., freight, milk tickets	913 74	
Cantwell Printing Co., printing	258 50	
Des Rivieres, G. R., Co., shavings	308 07	
Dopp & Watson, lumber, felt, hardware	69 04	
Diepold, P. J., blacksmithing, sharpening, shoeing, etc	80 55	
Deming Co., The, pump, sprayer	25 02	
Delwiche, E. J., superintendent, expenses	489 11	
Douglas Co., Poor farm, expenses	132 00	
Dickinson, A., Co., seeds	142 65	
Dennison Mfg. Co., tags	7 50	
Delwiche, O. J., expenses	7 00	
Deane Steam Pump Co., valves, etc	24 77	
Dairy and Short Course instruction pay roll, salaries	6,667 75	
Diederich, M., groceries, gasoline, etc	8 55	
Downing's Nursery, plants	3 00	
De Laval Separator Co., wheels	7 20	
Dresen & Rhodes, paints	3 50	
Dresen, T. F., repairs	6 75	
Dengler, C. M., lettering, numbering	54 58	
Dreer, H. A., plants	17 38	
Doyon & Rayne Lumber Co., lumber	14 14	
Dane Co. Telephone Co., rentals, etc	27 00	
Democrat Printing Co., printing	4,752 50	
Eimer & Amend, instruments, chemicals, etc	136 84	
Ewer, H. D., twine, seed, etc	12 92	
Electrical Supply Co., merchandise	113 49	
Emery, J. Q., & Son, pig, boar	60 00	
Ernecke & Salmstein, paint, enamel	25 00	
Enterprise Mfg. Co. of Pa., tools, etc	4 20	
Elliott Mfg. Co., pails	7 20	
Ellis, J. R., & Sons, tubs	78 00	
Elliott Addressing Machine Co., supplies	325 00	
Eastman, J. S., merchandise, shades	73 12	
Eastman, F. R., batteries	2 10	
Field, M., & Co., silk, merchandise	10 25	
Findorff, J. H., lumber, etc	513 50	

Fairchild, M. H., & Bro., powder	43 15	
Felton, A. P., keys, etc	11 10	
Faultless Rubber Co., tubing	9 50	
Fuller, J. G., instructor, salary and expenses	1,522 57	
Farrington, E. H., professor, salary	2,850 00	
Frederickson, A. D. & J. V., lumber	2,100 11	
Ferguson Bros., chemicals	127 92	
Ford, C. W., & Co., seed, potatoes	12 55	
Field Force Pump Co., fittings, sprayer, etc	7 47	
Fauerbach Brewing Co., barrels	5 00	
Foley Mfg. Co., boxes	18 80	
Fargo Creamery Supply House, salt, tester	27 25	
Ford, J. B., Co., cleaner, soda	15 00	
Findlay & Co., salt, etc	8 40	
Fuller, D. A., steers	375 00	
Fair, The, Madison, cans	6 00	
Fitch, J. W., vines	5 00	
Francis, A. V., tubs	34 50	
Fairbanks, Morse & Co., apparatus, tools, scale, etc	375 38	
Fuller & Johnson Mfg. Co., cultivators, handles, etc	142 00	
Gardening Co., The, subscription	3 25	
Geffert, L. A., repairs	5 45	
Grimm's Bindery, binding	184 75	
Gardner, W. H., expenses	44 15	
Goulds Mfg. Co., sprayer, cart, crosshead, etc	141 13	
Gusick, Richards & Roberts, calves	144 00	
Gay, L. W., lease, option, hay, etc	1,002 50	
Green, H. J., psychrometer	4 75	
Gallagher, J., Co., awnings, covers	65 00	
Gimbel Bros., carpet	2 75	
Gross, P., Hdw. Co., locks, hardware, springs	34 75	
Grasselli Chemical Co., lead, acid, chemicals	118 27	
Gamm, W. J., watch, etc	4 50	
Gaynor Cranberry Co., barrels, rent	98 07	
Gurley, W. & L. E., screws	8 68	
Gugel & Frisch, sawing	23 40	
Gould, Wells & Blackburn Co., mdse, salt, etc	138 63	
Hoffmann Feed Co., feed, oats, hay, wheat, etc	640 70	
Hastings, E. G., assistant professor, salary and expenses	1,001 32	
Harris, R. T., assistant, salary and expenses	1,019 16	
Humphrey, G. C., professor, salary	2,320 35	
Hoffmann, C., assistant, salary	1,005 80	
Hart, E. B., professor, salary	2,600 00	
Harris, S., & Co., hardware	1 56	
Hoffmann, B., Mfg. Co., fittings, etc	67 29	
Hausman & Dunn Co., instruments	34 44	
Harloff, P. F., batteries, merchandise	7 30	
Hippard, E., machine	6 00	
Hooverson, J. C., seed	125 00	
Hinrichs Dry Goods Co., batting	9 50	
Hill, C. L., expenses	5 18	
Hartford Steam Boiler Insurance Co., insurance	28 33	
Hoard, W. D., expenses	14 00	
Hubbard, T. S., Co., plants	14 70	
Holstein-Friesian Association, fees, registration	20 00	
Hardenberg, C. B., expenses	57 12	
Hofman, Mrs. J., mending	3 00	
Hogan, J., & Sons, pigs	22 00	
Hickory Grove Farm, sow	54 49	
Hoskins, W. H., Co., cases	16 00	
Hunt, E. H., liquid	4 00	
Hawkes Nursery Co., trees	12 36	
Hine, G. S., assistant, salary, expenses	495 48	
Haak, Wm., Jr., leather, oil, fittings, bells	15 15	
Hoffman, Wm., oats, etc	2,139 88	
Henry, W. A., emeritus professor, salary, expenses	2,006 30	
Howe Scale Co., scale	104 44	
Huels, F., keys, etc	14 70	
Heat and water, percentages	238 52	
Haswell Furniture Co., furniture, etc	401 67	
Hollister Drug Co., drugs, etc	66 78	
Hayes, J. D., horseshoeing	112 80	
Holden, P. G., lecture	25 00	
Hammersmith Engraving Co., engraving	155 37	
Hyland, W. J., mantles, etc	9 00	
Ingram-Richardson Mfg. Co., table top	6 00	
International Harvester Co., twine, repairs, etc	57 81	
Iron River Hardware Co., Paris green	11 80	
International Live Stock Exposition, rent, etc	90 52	

Ionia Pottery Co., pots	5 93	
Illinois Central Ry. Co., freight	31 55	
Jones, J. A., photos	1 00	
Jonas Bros., toweling	4 00	
Johnson & Field Mfg. Co., roller	30 00	
Jones, E. B., repairs	10 75	
Jones, E. R., instructor, expenses, salary	1,544 61	
Jahns, Louise M., instructor, salary	720 00	
Kleinheinz, F., instructor, salary, expenses	1,442 19	
Keyes, Wm., gravel	6 25	
Kinloch farm, skeleton	12 00	
Kellogg, W. E., & Son, plants	22 24	
Kopplin & Kopplin, lumber	8 32	
Keeley, Neckerman & Kessenich Co., merchandise, quilts, etc.	17 30	
Kiel Wooden Ware Co., boxes	17 50	
Klueter Bros., packing, middlings, feed	1,039 10	
Kny-Scheerer Co., model	33 50	
Klein Bros., cloth	4 90	
Keystone Wire Matting Co., mat	8 40	
Keuffel & Esser Co., level	45 00	
Kelly, Mrs. A. L., reporting	135 00	
Krueger, A. J., & Co., apples	1 00	
Kimble Glass Co., bottles, apparatus, tubes, etc	76 45	
Kiefer, A. J., painting, etc	25 00	
Kornhauser, A., & Co., crash	16 42	
Knight, C. S., assistant, salary, expenses	461 27	
Kroncke Bros., hardware	53 30	
Klueter & Co., middlings, feed, meal, etc	501 90	
Koch, F., rent of land	150 00	
Kaempfer, F., rats	3 00	
Kellogg Bros. Lumber Co., lumber	87 42	
King & Walker Co., oven, weights, castings, etc	128 72	
Lake, H., Sons Co., trees	1 50	
Lake, D. S., seedlings	24 10	
Listman Mill Co., refund	75 00	
Leshonsky Bros., pig	20 00	
Levitan, S., toweling	7 00	
Library Bureau, cabinet	65 00	
Lovejoy, A. J., & Son, boar	200 00	
Luther & Jensen, hardware	5 55	
Larson, L. N., expenses	5 00	
Lockard, A. M., Jr., cash register	213 75	
Madison Saddlery Co., straps, blanket, harness, etc	76 32	
Milward, J. G., instructor, salary, expenses	1,385 57	
McCollum, E. V., instructor, salary	1,200 00	
Mueller Co., The, steam fitting	36 00	
Mason, E. S., pole, tongue	5 75	
MacVeagh, F., & Co., rice	225 00	
Michigan Carbon Works, floats, phosphate	4 00	
Milwaukee Leather Belt Co., belting	41 76	
Morrill & Morley, tank	12 00	
Macey Co., The, cards, case	15 24	
McComb, C. J., expenses	25 90	
Meyer, J. J., drilling	146 52	
Michels, M., assistant, expenses, cheese	76 49	
Moneyweight Scale Co., scale	80 00	
Malde, O. G., assistant, expenses	550 40	
Marshall, R. R., expenses	401 60	
Moore, R. A., professor, expenses, salary	2,638 23	
Millar, A. V., tracing	1 95	
Myers, F. E., & Bro., pump	9 01	
Minch, H. J., oats, feed	651 00	
Martin, J. W., stallion service	28 00	
Madison Gas & Electric Co., gas, current, lamps, etc	2,727 17	
McKerrow, G., superintendent, salary, expenses, bills paid	6,146 78	
Moore, J. G., assistant professor, expenses, salary	1,549 89	
Mitchell, C., repairing, corn	11 50	
Marvin, G. A., team and labor	85 96	
McLeod, A. F., salary	120 00	
Martin, W. J., pigs	60 00	
Maple Lawn Fruit Farm, fruit	9 80	
Marchall Dairy Laboratory, extract, etc	8 92	
Madison Paint & Wall Paper Co., bronze liquid	2 60	
Mandel Engraving Co., cuts, drawings, etchings, etc	177 86	
Madison Tent & Awning Co., awnings, cloth, etc	35 60	
Meier & Kelly, groceries, gasoline, etc	48 34	
Meyer, F. M., shoeing	72 45	
Mayers, A. A., merchandise, drugs, paints, seeds, etc	84 76	

Moseley, J. E., stationery, kodak	158 23	
Menges Pharmacy, drugs, etc	105 60	
Mautz Bros., paints, shades, etc	276 43	
McClurg, A. C., & Co., books	219 55	
May, L. L., & Co., trees, plants, seeds	103 79	
Marty, G., expenses	4 90	
Niemann, O., ice	36 00	
National Chemical Co., flakes	10 50	
Netherwood, P., stallion service	15 00	
New York Market Gardener's Association, seeds	2 00	
National Enameling & Stamping Co., hoops	13 13	
Neal, Chas., stallion service	14 00	
Nelson, N. M., Paris green	5 62	
Noblet, H. J., pig	20 00	
Neostyle Co., neostyle	127 40	
National Distilling Co., alcohol	76 91	
Northern Electrical Mfg. Co., pulley, motor, brushes, etc.	373 40	
Northrup, King & Co., seed	21 73	
Nielson, E. C., photos, slides, etc	206 50	
New York Store, mdse	32 40	
Owens, Wm., plumbing	261 73	
Ott's Pharmacy, sulphate	12 50	
Orr & Lockett Hardware Co., hardware	2 96	
Oakey, M., expenses	12 78	
Owens, J. L., Co., apparatus	19 00	
Olson, G. A., instructor, salary	1,500 00	
Otis, D. H., assistant to dean and professor, salary and expenses	2,603 58	
O'Malley & Castle, fence, wire	53 00	
Ocock, C. A., assistant professor, salary, expenses	1,505 60	
Oppel's Fancy Grocery, oil, etc	10 50	
O'Neil Oil & Paint Co., soda ash	5 00	
Olds Seed Co., L. L., buckwheat, seeds	31 85	
Pettingill, J. A., rent	100 75	
Pure Gluten Food Co., gluten	300 00	
Pierstorff, Wm., oats	105 15	
Pitman Dry Goods Co., merchandise	8 95	
Parnell, G. W., funnel, lambs	25 55	
Postal Telegraph Co., messages	1 35	
Penney Co., A. M., sacks	10 71	
Purcel, Thos., sheep	20 00	
Perry, H. B., seed	12 00	
Percheron Society of America, book	5 00	
Pearson, C. L., plants	43 31	
Pattison, C. H., potash	7 75	
Polk & Co., R. L., periodicals	6 00	
Pannack, E. F., stone	27 00	
Pecher, F. J., suits	7 20	
Parkinson-Marling Co., lumber	23 45	
Polacheck & Bro. Co., C., holders	6 50	
Page Woven Wire Fence Co., gates	14 70	
Palace of Sweets, cream	6 00	
Preston & Rounds, books	4 10	
Phoenix Nursery Co., plants	4 05	
Pieh, J. F., sand	12 50	
Post Publishing Co., printing	314 21	
Parsons Ptg. & Sta. Co., stationery, printing	602 26	
Pickarts, L. J., bursar, postage, bill paid	2,707 05	
Piper Bros., mops, groceries, etc.	93 28	
Quaker Oats Co., avena, oats	411 93	
Rogers, A. J., Jr., assistant, expenses, salary	747 92	
Ravenel, M. P., professor, salary	2,500 00	
Roesch, L., vines	4 10	
Reid, J. L., seed	12 25	
Robertson Soap Co., T. B., soap	13 25	
Riverside Printing Co., circulars	285 00	
Rhodes & Co., J. H., chloride	23 49	
Richards, M. W., expenses	34 77	
Ridgway, J. A., photos	2 00	
Renk, W. F., ewes	125 00	
Red Polled Cattle Club of America, registration	4 25	
Remington Typewriter Co., rent, repairs, etc.,	19 21	
Russell, H. L., dean and director, expenses, salary	4,181 13	
Sandsten, E. P., professor, salary, expenses	2,607 42	
Standard Paper Co., paper	17 35	
Suzuki, S. K., research assistant, salary	500 00	
Stark Bros. Nurseries, box, plants	10 50	
Shearer, Jas., lime	23 60	
Star Milk Cooler Co., tires	1 90	

Stoelting Co., C. H., aluminum, dishes	28 10	
Smith, W. H., rent, team and labor	190 69	
Scheler, H., storage	15 00	
Schaeffer & Budenberg Mfg. Co., keys, etc	12 22	
Schwoegler & Bliss, fittings	1 80	
Stern & Sons, B., bran, refund	432 50	
Stehr, Wm., meats	18 74	
Smith Premier Typewriter Co., ribbons, supplies, cabinet	132 78	
Stone, A. L., instructor, salary	680 00	
Sammis, J. L., assistant professor, salary, expenses	1,806 49	
Stoddart, C. W., assistant professor, salary, expenses	1,641 69	
Sladky, P., assistant, salary	19 50	
Smith, K .W., instructor, salary, expenses	901 13	
Salzer Seed Co., J. A., alfalfa, seeds	31 25	
Southwestern Milling Co., refund	50 00	
Sewell-Clapp Mfg. Co., envelopes	39 90	
Smith & Baumann, repairs, knives	63 40	
Seyk & Co., W., peas	30 00	
State of Wisconsin, insurance	829 07	
Somerville Co., T., tank	54 54	
State Journal Ptg. Co., printing	5 14	
Swenson & Moe, barrels	2 20	
Schroeder, H., express	4 00	
Schroeder Lumber Co., J., lumber	177 95	
State Board of Agriculture, hay	11 00	
Stephens, David, stone	17 75	
Spencer, C. A., drugs	12 00	
Sharples Separator Co., separator	28 00	
Swits, H. A., pigs	9 45	
Schanck, W. P., bull	240 00	
Schroeder, W. C., expenses	157 24	
Sumner & Cramton, drugs	1 50	
Schmidt, Wm., tools, spout, repairs, etc	39 28	
Swift & Co., meal, soda, fertilizer, etc	257 99	
Store room, merchandise	22 66	
Sargent & Co., E. H., chemicals, supplies, apparatus	1,133 21	
Stechert & Co., G. E., books	250 33	
Sumner & Morris, hardware	330 65	
Standard Oil Co., oil, wax, gasoline, etc	77 67	
Troemner, H., weights	5 36	
Taylor & Gleason, printing	17 50	
Thatcher Mfg. Co., bottles	158 63	
Toepfer, O., Agt., silo	300 00	
Tebbe & Co., C. H., covers	25 00	
Techam, Fred, stalks	30 00	
Torsion Balance Co., weights, pans, scales	64 60	
Thomas Co., A. H., instruments, boxes	20 01	
Thorburn & Co., J. M., seeds	30 64	
Tottingham, W. E., instructor, salary, expenses	1,001 98	
Tracy, Gibbs & Co., printing	571 28	
University pay roll, janitors, etc	1,127 41	
Union Transfer & Storage Co., wagon, cultivator	26 50	
University Cooperative Co., stationery	19 70	
United States Express Co., express	199 57	
Victor Chemical Works, jellacid, chemicals	10 80	
Van Schaak & Sons, soda	6 78	
Van Hoogen, J., use of thresher and engine	29 40	
Vaas-Maw Dry Goods Co., towels, cloth	13 23	
Valvoline Oil Co., oil	3 80	
Vaughan's Seed Store, seeds, hose, tools	53 16	
Ware Bros. Co., book	3 00	
Wisconsin Wagon Co., wagon and repairs, bars	9 00	
Wells-Higman Co., baskets, etc	21 30	
Walker, M., book	1 00	
Wilson Memindex Co., index	1 50	
Washburn-Crosby Co., bran	245 00	
Wisconsin Dairy Supply Co., thermometers	1 40	
Wiedenbeck, Dobelin & Co., hardware	15 00	
Wisconsin Telephone Co., messages, service, etc	16 60	
Whalen, J. L., stallion service	15 00	
Wilson, A. E., book	10 00	
Western Electric Co., merchandise	11 90	
Whitall Tatum Co., tubes	2 50	
Warner, E. E., wood	4 75	
Wilkinson, W. H., rabbits	5 25	
Walster, H. L., expenses	141 48	
Whitson, A. R., professor, salary, expenses	2,513 73	
Woll, F. W., professor, salary, expenses	2,504 43	
West, J. P., veterinary services	17 00	

Wolff, Kubly & Hirsig, hardware	213 46	
Western Union Telegraph Co., messages, etc.	28 43	
Wehrmann, Chas., repairs	81 10	
Yawkey-Crowley Lbr. Co., lumber	401 45	
Zeimer Disinfectant Co., zenoleum	30 48	
Zerbel, L. R., expenses	47 86	
Total		$240,759 40

COLLEGE OF LETTERS AND SCIENCE

Adams, T. S., associate professor, salary	$2,300 00	
Allen, Katharine, instructor, salary	1,200 00	
American Express Co., express	78 20	
Arzberger, E. G., assistant, salary	498 63	
Allen, Ruth F., assistant, salary	300 00	
Ashmun, Margaret E., assistant, salary	565 00	
Ambler, C. H., assistant, salary	400 00	
Allen, C. E., associate professor, salary	2,000 00	
Allen, Florence E., instructor, salary	1,100 00	
Allen, B. M., instructor, salary	1,250 00	
Andrews, J. B., assistant, salary	1,000 00	
Alberene Stone Co., stone, strainers	50 77	
Angler's Bait & Mfg. Co., terrapin	9 60	
Automatic File & Index Co., stationery, cabinet	78 12	
American Entomological Co., mounts	2 00	
Alford Bros., laundry	28 00	
Andrae & Sons Co., J., merchandise	122 82	
Aldrich, L. B., assistant, salary	320 00	
Abbott, E. P., drafting	11 70	
American Instrument Co., milliameter	34 50	
Administration pay roll, clerks, etc.	5,620 65	
Atkinson, Mentzer & Grover, pictures	7 98	
Andrews Co., A. H., chairs	15 00	
Burchell, D. Earle, professor, salary	3,325 74	
Bode, B. H., assistant professor, salary	1,500 00	
Birkhoff, G. D., instructor, salary	1,100 00	
Breslich, A. L., instructor, salary	1,000 00	
Bassett, H. K., lecturer, salary	1,200 00	
Bartholomew, B., assistant, salary	900 00	
Burdick, L. W., fellow, salary	400 00	
Burger, Peter, hardware	11 85	
Baumbach-Reichel Co., ammonia	55 62	
Bradley, H. C., assistant professor, salary	1,500 00	
Brewer, R. K., assistant, salary	400 00	
Blackwelder, E., assistant professor, salary, etc.	1,665 50	
Bardeen, C. R., dean and professor, salary, etc.	3,834 00	
Boyd, C. E., fellow, salary	400 00	
Besly & Co., C. H., steel, tubing, brass, etc.	13 49	
Brannon, J. M., assistant, salary	400 00	
Bridgman, B. W., assistant, salary	400 00	
Brandt, J. G., assistant, salary	575 00	
Bruns, F., instructor, salary	1,000 00	
Bloomfield, L., assistant, salary	400 00	
Beatty, A., assistant professor, salary	1,400 00	
Bleyer, W. G., assistant professor, salary	1,600 00	
Brainard, F. K., assistant, salary	600 00	
Bowles, J. T., chemist, salary and expenses	979 24	
Bashford, Erma M., instructor, salary	900 00	
Berkeley, Frances C., instructor, salary	1,100 00	
Bredin, E. A., instructor, salary	1,025 00	
Birge, E. A. dean and professor, salary	4,509 50	
Bartlett, J. L., assistant professor, salary	225 00	
Burdick & Murray Co., toweling, etc.	3 30	
Bresler Co., F. H., carbon	9 00	
Blackman, J. R., assistant, salary	400 00	
Bartholomew, E., copies fungi col	12 20	
Bailey, W. L., assistant, salary	125 00	
Bean, B. C., salary	25 00	
Bischoff, G. L., plastering	402 00	
Bunting, C. H., expenses	49 70	
Bausch & Lomb Optical Co., lens, chemicals, apparatus	528 37	
Barnes & Co., A. S., directories	8 75	
Bliss, W. D. P., lectures	35 00	
Blied & Schneider, hardware	39 08	
Bain, H. F., expenses, etc.	42 64	
Barker, F. D., slides	5 00	
Bouchard, J., electroplating	3 00	
Barbee Wire & Iron Works, fence	13 87	
Buffalo Dental Mfg. Co., chemical apparatus	43 50	

Bardeen, C. W., advertising	15 00	
Campbell, R. A., laboratory assistant, salary	400 00	
Commons, J. R., professor, salary	3,000 00	
Cool, C. D., instructor, salary	1,000 00	
Cairns, W. B., assistant professor, salary	1,800 00	
Curtis, R. E., scholar, salary	225 00	
Crafer, T. W. B., fellow, salary	400 00	
Cox, G. H., fellow, salary	400 00	
C. & N. W. Ry. Co., freight	114 28	
C. M. & St. P. Ry. Co., freight	61 21	
Crane Co., pipe, etc.	57 57	
Cunliffe, J. W., professor, salary	3,000 00	
Cance, A. E., fellow, salary	400 00	
Cole, R. G., professor, salary	3,000 00	
Coffin, Victor, assistant professor, salary	2,000 00	
Cook, E. A., instructor, salary	1,000 00	
Colburn, G. B., assistant, salary	500 00	
Chase, W. J., assistant, salary	700 00	
Coulter, J. L., assistant, salary	400 00	
Chicago Calcium Light Co., gas	5 25	
Chautauquan, The, advertising	19 12	
Central Scientific Co., slides, etc.	31 25	
Corson, O. T., advertising	13 00	
City of Madison, water	30 02	
Clow & Sons, J. B., fittings	10 81	
Cooley, A. S., slides	25 00	
Catholic School Journal Co., advertising	17 00	
Crowe, Belle C., refreshments	30 00	
Central Pub. Co., advertising	42 50	
Copps Bros., contract	128 00	
Collins, F. S., fascicle	5 00	
Capital City Fuel Co., cement; plaster	13 90	
Conklin & Sons, coal, etc.	2,277 79	
Cooley, C. F., coal	10,163 15	
Columbia Phonograph Co., records, attachment	26 75	
Chapman Dry Goods Co., T. A., vase	8 50	
Colorado School Journal, advertising	12 00	
Cary, C. P., state superintendent, dictionary	7 50	
Collier's Weekly, advertising	99 75	
College Book Store, stationery, books	28 48	
Capital City Paper Co., paper, etc.	2 75	
Cantwell Printing Co., printing	121 35	
Castle & Doyle, cement, coal, lime	41 84	
Dearborn, W. F., assistant professor, salary	1,800 00	
Dennis, A. L. P., professor, salary and expense	2,526 60	
Daniells, W. W., emeritus professor, salary	1,750 00	
Denniston, R. H., assistant professor, salary and expense	1,450 92	
Du Mez, A. G., assistant, salary	500 00	
Dye, D. S., assistant, salary	400 00	
Dowling, L. W., assistant professor, salary	2,225 00	
Duval, E. P. R., instructor, salary	1,100 00	
Delhi, J. O., assistant, salary	600 00	
Dickinson, T. H., assistant professor, salary	1,625 00	
Dudgeon, M. S., instructor, salary	500 00	
Dodge, R. E. N., assistant professor, salary	1,600 00	
Duncalf, F., assistant, salary	400 00	
Dilworth, J. F., assistant, salary	500 00	
Democrat Printing Co., printing	85 90	
Diamond Expansion Bolt Co., shields	50 49	
Donnelly & Sons Co., booklets	36 00	
Dengler, C. M., lettering	12 80	
Dunbar, F. J., slides	25 75	
Dresen & Rhodes, paints, etc.	25 26	
Dean, A. F., salary and expenses	101 20	
Davis, L. L., rheostat	10 00	
Dearholt, H. E., Dr., slides	4 00	
Dudley, W. H., slides	15 00	
Davis Co., John, lead, etc.	17 93	
Dean, A. T., salary	15 00	
Dreka Co., The, stationery	31 63	
Doyon & Rayne Lbr. Co., lumber	2 25	
Dick Co., A. B., paper	7 00	
Erlanger, Joseph, professor, salary and bills paid	3,032 14	
Evans, M. B., assistant professor, salary	1,100 00	
Elliott, E. C., professor, salary	2,750 00	
Ely, R. T., professor, salary	4,000 00	
Electrical Supply Co., merchandise, motor	194 12	
Eimer & Amend, acid, apparatus, etc.	525 45	
Educator-Journal Co., advertising	20 00	

Education Review, advertising	22 80	
Eberle, E. G., citriodora	8 85	
Elsom, J. C., professor, salary	300 00	
Eclipse Paint & Mfg. Co., paint	78 00	
Educator School Supply Co., advertising	10 00	
Engelhardt, M., cloth	3 66	
Elastic Tip Co., casters	6 30	
Fish, C. R., associate professor, salary	2,000 00	
Fiske, G. C., assistant professor, salary	1,800 00	
Frost, W. D., associate professor, salary and research	2,145 00	
Findorff, J. H., repairs, labor, stands, etc.	279 00	
Frederickson, A. D. & J. V., lumber	530 00	
Fuller, C. A., instructor, salary	1,000 00	
Forsythe, W. E., assistant, salary	400 00	
Freeman, J. C., professor, salary	3,300 00	
Fischer, R., assistant professor, salary	700 00	
Ford, A. C., assistant, salary	250 00	
Ferrosteel Co., registers	27 08	
Foerst, J. P., mechanician, salary	1,200 00	
Frederickson, A. D. & J. V., lumber	3 50	
Fox, A. W., instrument	16 50	
Field, E. S., Agt., books	19 52	
Felton, A. P., keys, etc.	7 20	
Foote Mineral Co., minerals	202 32	
Flick, E. C., salary	15 00	
Ferris Baggage Co., cartage	1 50	
F. F. F. Laundry, laundry	10 42	
Fairbanks, Morse & Co., pulley	2 12	
Fenneman, N. M., professor, salary and expenses	313 41	
Field & Co., M., rugs, mdse.	13 14	
Gage, O. A., assistant professor, salary	1,400 00	
Grey, E. G., assistant, salary	400 00	
Gaarden, O. H., assistant, salary	400 00	
Griffin, J. S., assistant, salary	500 00	
Goodnight, S. H., assistant professor, salary	1,550 00	
Gates, C. B., assistant, salary	300 00	
Grimes, N. C., instructor, salary	1,000 00	
Gilman, S. W., assistant professor, salary and expenses	1,597 75	
Gesell, G. A., statistical work	25 80	
Gay, Lucy M., assistant professor, salary	1,500 00	
Giese, W. F., associate professor, salary	1,500 00	
Gamm, W. J., watch, clock, etc.	7 50	
Gillan & Co., S. Y., advertising	17 00	
Gardner Co., A. H., belting	7 68	
Graves, F. B., salary	325 00	
Goodyear Rubber Co., rubber	5 60	
Grimm's Bindery, binding	42 00	
Gigolds, H. S., model	35 50	
Gray Herbarium, cards	100 85	
Goodwin, W., salary	20 00	
Hess, R. H., assistant, salary	750 00	
Hacker, E. F., scholar, salary	225 00	
Hall, R. D., instructor, salary	1,350 00	
Helmholz, A. A., assistant, salary	400 00	
Hunt, Caroline L., professor, salary and expenses	2,030 22	
Hegner, R. W., assistant, salary	400 00	
H'Doubler, F. T., scholar, salary	225 00	
Haswell Furniture Co., desks, furniture, etc.	452 97	
Holmes, S. J., assistant professor, salary	1,600 00	
Harper, R. A., professor, salary and expenses	3,314 77	
Hill, C. W., assistant, salary	500 00	
Hickman, M. A., assistant, salary	400 00	
Heil, H. G., instructor, salary	800 00	
Hub, The, hangers	1 50	
Huntington, Ellen A., instructor, salary and expenses	1,418 03	
Hooton, E. A., scholar, salary	225 00	
Hubbard, F. G., professor, salary	3,355 20	
Haussmann, J. F., instructor, salary	1,000 00	
Hohlfeld, A. R., professor, salary	3,000 00	
Hicks, F. C., instructor, salary	1,000 00	
Hancock, G. D., fellow, salary	400 00	
Hornbeck, S. K., fellow, salary	400 00	
Heat and water, percentages	9,540 72	
Hawes, C. H., lecturer, salary	1,000 00	
Herrick, L. R., instructor, salary and expenses	1,250 00	
Hinrichs Dry Goods Co., batting	9 50	
Haskins Co., W. H., cases	4 00	
Huels, Fred, locks, etc.	65	
Haynes, C. C., book	1 50	

Hollister Drug Co., drugs, etc.	329 97	
Hackendahl & Schmidt Co., fire escapes	185 00	
Heil Chemical Co., H., chemicals	335 16	
Harloff, P. F., mantles	16 00	
Hyland, W. J., mantels, etc.	8 45	
Henry, Alice, lecturer	45 00	
Harvard App. Co., instruments	85 05	
Hardy & Co., F. A., prisms	7 58	
Heddles, J. R., expenses	1 30	
Illinois Central Ry. Co., freight	23 51	
Ingersoll, L. R., instructor, salary	1,200 00	
Ives, G., salary	117 00	
Illinois Electric Co., switches, mdse.	209 80	
Illinois Paper Box Co., paper	10 28	
Illinois Glass Co., apparatus	7 63	
Jolivette, Hallie M., assistant, salary	400 00	
Johnson, A. R., assistant, salary	500 00	
Johnstone, A. H., instructor, salary	1,000 00	
Jastrow, Joseph, professor, salary	2,900 00	
Juergens, Carl, drafting, charts	21 34	
Jones Mfg. Co., filter	2 30	
Jaap, O., fungi	5 40	
Jonas Bros., toweling, rug	3 98	
Jameson, J. F., salary	200 00	
Knowlton, P. A., scholar, salary	225 00	
Kahlenberg, L., professor, salary	3,000 00	
Kremers, Edward, professor, salary	2,500 00	
Klein, D., fellow, salary	400 00	
Krauskopf, F. C., instructor, salary	800 00	
Kornhauser, A., & Co., velvet, napkins, linen, etc.	23 20	
Kerr, Alexander, emeritus professor, salary	1,000 00	
Krey, A. C., scholar, salary	225 00	
Kind, J. L., instructor, salary	1,200 00	
Kostalek, J., scholar, salary	225 00	
Koch, A. R., assistant, salary	120 00	
Knabe, H. A., castings	1 74	
Koelker, W. F., instructor, salary	1,350 00	
Keith, O. L., instructor, salary	1,100 00	
Kelly, F. T., instructor, salary	1,200 00	
Kenny, J. F., assistant, salary	205 00	
Kenyon, E. W., assistant, salary	400 00	
King & Walker Co., castings, oven, etc.	89 23	
Klein Bros., stain	3 00	
Knuppel, A. E., expenses, collecting	14 30	
Keystone View Co., views	51 00	
Kline, G. T., salary	60 00	
Keuffel & Esser Co., anemometer, rods, etc.	27 00	
Kohl, M., instruments	50 70	
Kroncke Bros., hardware	80 44	
Kohler, F., apparatus	50 21	
Kny-Scheerer Co., apparatus, chemicals, etc.	784 60	
Laird, A. G., associate professor, salary	2,000 00	
Lutman, B. F., fellow, salary	400 00	
Leith, C. K., professor, salary	2,000 00	
Lewis, C. E., salary	800 00	
Lenher, Victor, professor, salary	2,500 00	
Lyman, R. L., assistant professor, salary	1,800 00	
Lathrop, H. B., associate professor, salary	2,000 00	
La Motte, F. A., assistant, salary	500 00	
Library Bureau, cards, etc.	31 20	
Leonard, W. E., instructor, salary	1,000 00	
Lorenz, E. H. J., salary	3 96	
Leitz, E., chemicals, microscopes, etc.	659 21	
Lynch, P., bag	5 00	
Lawrence, G. R., Co., slides	10 00	
Lehmann, V. V., salary	50 00	
Leybolds, Nachfolger E., apparatus	100 00	
Lydow, H., book	7 95	
Le Febvre, C. C., assistant, salary	280 00	
Lyons, R. E., salary	325 00	
Louisiana School Review, advertising	7 50	
Loeb, I., salary	325 00	
Lake, E. J., salary	125 00	
Lorenz, M. O., assistant professor, salary	250 00	
Marshall, W. S., associate professor, salary	1,800 00	
March, H. W., instructor, salary	1,100 00	
Michell, R. B., instructor, salary	1,200 00	
Mendenhall, C. E., professor, salary	2,700 00	
McDaniel, A. S., instructor, salary	800 00	

Munro, D. C., professor, salary	4,100 00	
Mautz Bros., shades, paints, etc	240 38	
McMahon, T. S., fellow, salary	400 00	
Mayers, A. A., drugs, paints, mdse	62 46	
McClernan, T. J., scholar, salary	225 00	
Moseley, J. E., stationery	66 47	
McKitrick, R., scholar, salary	225 00	
Marquette, W. G., instructor, salary	1,006 01	
Mott, W. R., salary	490 00	
Martin, L., instructor, salary and telegrams	1,410 80	
McClurg, A. C., & Co., books	167 45	
Morgan, B. Q., instructor, salary	800 00	
Miller, W. S., associate professor, salary	2,000 00	
McMahon, E., fellow, salary	400 00	
Maurer, H. H., fellow, salary	400 00	
McGilvary, E. B., professor, salary	3,500 00	
McKinley Pub. Co., maps	13 88	
Marquis, A. N., & Co., book	4 00	
Myers, P. H., clerical work	80 00	
McIntosh Stereopticon Co., lamp	8 10	
Mead, W. J., assistant, salary	480 00	
Midland Schools, advertising	30 00	
Menges Pharmacy, drugs, etc	3 20	
McCollum Mfg. Co., desk systems	6 67	
McFadden, M. I., salary	75 00	
Madison Tent & Awning Co., awnings, etc	3 75	
Millar, G. W., & Co., paper	5 25	
Madison Paint & Wall Paper Co., paints, etc	30 42	
Metz, A., apparatus	5 00	
Mandel Engraving Co., half tones	17 08	
Martin, E. G., knife	4 25	
Mason, Max, expenses	225 00	
McLeod, M. L., salary	175 00	
Moody, S. E., instructor, salary	300 00	
Meister, E., covers	3 00	
Morgan, G. F., slides	12 50	
Miller Lock Co., locks	3 70	
Marine Biological Laboratory, specimens	5 41	
Madison Gas & Electric Co., gas and current	4,864 80	
Nielson, E. C., slides, etc	169 70	
Nelson, O. O., assistant, salary	500 00	
National Distilling Co., alcohol	52 10	
Norwood, J. N., scholar, salary	225 00	
Newport, Clara P., fellow, salary	400 00	
Northrop, G. N., instructor, salary	1,000 00	
Neidig, W. J., instructor, salary	1,000 00	
Newell, J. I., assistant, salary	250 00	
Northwestern Compo-Board Co., compo-board	6 72	
Nachet, A., apparatus	256 60	
New England Publishing Co., advertising	20 00	
Nebraska Teacher, advertising	10 00	
National Carbon Co., cells	3 80	
Northern Electric Mfg. Co., motor, pulley, wire, etc	1,161 55	
Newbury & Peper, hinges	10 80	
Newton & Co., instrument	1 40	
Overton, J. B., assistant professor, salary	1,400 00	
O'Shea, M. V., professor, salary	3,100 00	
Otto, M. C., fellow, salary	400 00	
Oswald, F. W., Jr., assistant, salary	500 00	
Owen, E. T., professor, salary	1,300 00	
Owen, H. E., instructor, salary	1,225 00	
Olson, J. E., professor, salary	2,600 00	
On Sing Co., dishes	3 45	
Owens, William, plumbing	16 32	
Osterloh, P., model	25 80	
Olive, E. W., expenses	2 00	
Ohio Teacher, advertising	14 00	
Parkinson, J. B., emeritus professor, salary	1,900 00	
Parker, F. A., emeritus professor, salary	1,395 00	
Pitman, Jennie M., chart work	100 75	
Parsons Ptg. & Sta. Co., stationery	627 99	
Pickarts, L. J., bursar, postage, bills paid, etc	730 45	
Parke, Davis & Co., slides	8 55	
Patterson, D. L., instructor, salary	1,300 00	
Phillips, U. B., assistant professor, salary	1,125 00	
Price, W. H., instructor, salary	1,200 00	
Prokosch, E., instructor, salary	1,400 00	
Plagge, H. J., assistant, salary	400 00	
Pyre, J. F. A., assistant professor, salary	1,800 00	

Parkinson-Marling Lumber Co., lumber	44 14	
Pickarts, Mary E., assistant, salary	40 00	
Partridge, W. H., salary	50 00	
Post Publishing Co., printing	197 82	
Palestine Exploration Fund, map	73 77	
Peabody, A., bills paid	5 45	
Pitman Dry Goods Co., muslin	3 90	
Public School Pub. Co., advertising	14 40	
Parey, P., apparatus	20 02	
Parker, C. M., advertising	17 68	
Post, L. I., music	20 00	
Pynch, J. A., assistant, salary	300 00	
Paunack, E. F., stone	13 00	
Parker Educational Co., advertising	25 52	
Patzer, O., salary	150 00	
Purin, C. M., salary	100 00	
Potter, R. S., salary	97 50	
Packard, O. L., Machinery Co., tool	14 50	
Piper Bros., groceries, etc.	50 92	
Ross, A. E., professor, salary	2,850 00	
Reinsch, P. S., professor, salary	3,500 00	
Roebuck, J. R., instructor, salary	1,200 00	
Roe, F. W., instructor, salary	1,350 00	
Roloff, W. E., assistant, salary	600 00	
Roedder, E. C., assistant professor, salary	1,600 00	
Reed, F. O., assistant professor, salary	1,500 00	
Robins, R., expenses	15 00	
Russell, H. L., expenses	90 85	
Revel, A. H., & Co., desks	46 60	
Rinder, Mathilda L., assistant, salary	40 00	
Rhodes, J. H., & Co., chemicals	13 36	
Rankin, C. A., salary	15 00	
Reed, G. M., assistant professor, salary and expenses	152 82	
Rand, McNally & Co., maps	138 56	
Remington Typewriter Co., rent, etc.	14 00	
Rogers, A. J., Jr., specimens	5 00	
Scott, J. F., assistant, salary	400 00	
Sellery, G. C., associate professor, salary	3,050 00	
Sharp, F. C., professor, salary	2,700 00	
Sparling, S. E., assistant professor, salary	1,400 00	
Scott, R. B., assistant professor, salary	1,500 00	
Shanks, L. P., instructor, salary	1,100 00	
Schlatter, E. B., instructor, salary	1,100 00	
Shannahan, W. D., assistant, salary	300 00	
Simmons, Emma G., fellow, salary	400 00	
Skinner, E. B., assistant professor, salary	2,275 00	
Smith, H. A., professor, salary	2,800 00	
Sterling, Susan A., assistant professor, salary	1,500 00	
Smith, E. R., instructor, salary	1,000 00	
Slichter, C. S., professor, salary	3,000 00	
Sargent, E. H., & Co., apparatus, chemicals	45 15	
Standard Adding Machine Co., paper	6 00	
Slatington-Bangor Slate Syndicate, blackboard	12 14	
Store Room, mdse	33 86	
Schulz, R. L., assistant, salary	400 00	
Schaffner, Margaret A., instructor, salary	575 00	
Shepard, W. J., instructor, salary	1,000 00	
Scholz, R. F., instructor, salary	1,000 00	
Smith, C. F., professor, salary, slides	3,007 95	
Snow, B. W., professor, salary	3,000 00	
Smith, A. W., instructor, salary	1,000 00	
Slaughter, M. S., professor, salary, slides	3,012 00	
Showerman, G., assistant professor, salary	1,800 00	
Steve, W. F., assistant, salary	400 00	
Sutherland, A. H., assistant, salary	625 00	
Scott, W. A., professor, salary	3,700 00	
Schilling, M., models	205 12	
Sumner & Morris, hardware	128 69	
Sumner & Cramton, drugs, etc.	5 10	
Schmidt, Wm., models, etc.	75	
Steidtmann, E., assistant, salary	320 00	
Schelling, F. E., salary	150 00	
Sommer, G., & Fglio, slides	11 82	
Sears, Roebuck & Co., scales	5 94	
Swain, G. R., slides	28 47	
Sittig, J. W., apparatus	10 10	
School Science & Math., advertising	12 50	
Sumner, E., & Son, drugs, etc.	65	
State of Wisconsin, insurance	1,658 14	

Shinn, F. L., instructor, salary	139 33	
School Education, advertising	21 60	
Southern School Journal, advertising	15 24	
Stout, A. B., collecting flora	1 44	
Stechert, G. E., & Co., books	425 77	
Stoelting, C. H., & Co., calorimeter, instruments	32 35	
Slade, M. T., assistant, salary	180 00	
Stone, A. H., salary	300 00	
Scientific Shop, calorimeter	54 50	
Spencer Lens Co., instruments, apparatus, etc.	320 92	
Saffle, C. A., stationery	7 00	
Smith, L. C., & Bros., typewriter, supplies	73 65	
Standard Paper Co., paper	13 30	
Sphung, A. A., crawfish, frogs	20 00	
Salisbury, R. D., lecturer	33 80	
Smith Premier Typewriter Co., machine	70 00	
Southern Educational Review, advertising	6 00	
South Dakota Journal of Education, advertising	5 00	
Tibbals, Jr., C. A., instructor, salary	875 00	
Tressler, A. W., inspector, salary	2,000 00	
Taylor, H. C., associate professor, salary	2,300 00	
Turner, F. J., professor, salary	4,000 00	
Tracy, Gibbs & Co., printing	810 80	
Taylor, A. W., scholar, salary	193 75	
Tyrrell, Joseph, cases	23 20	
Titsworth, W. A., assistant, salary	700 00	
Titus, M. E., student assistant, salary	400 00	
Terry, E. M., instructor, salary	1,150 00	
Taylor, A. H., assistant professor, salary	1,600 00	
Turner Brass Works, ball	7 00	
Thomas, A. H., Co., forceps, camera, jars, etc.	563 11	
Thompson, A. T., Co., boxes	6 00	
Thurston, J. H., slides	34 30	
Truax, Green & Co., skeletons	43 00	
Teachers' Journal Printing Co., advertising	11 40	
Texas School Journal, advertising	12 00	
Timlin, Winifred, stencil work	20 00	
Teacher Printing Co., advertising	16 00	
Tubbs Mfg. Co., cabinet	18 49	
Training of Teachers pay roll, instruction	1,000 00	
Underwood Typewriter Co., machine, ribbons, etc.	380 25	
University Cooperative Co., stationery	46 75	
Underhill, A. L., instructor, salary	1,200 00	
University pay roll, janitors, etc.	11,947 98	
United States Express Co., express	47 70	
University of Chicago Press, advertising	28 80	
Underwood & Underwood, photos	25 00	
Von Teubern, E. F., assistant, salary	400 00	
Vorhies, C. T., assistant, salary	800 00	
Van Vleck, E. B., professor, salary	3,500 00	
Veerhusen, Elsbeth, instructor, salary	1,100 00	
Voss, Ernst, professor, salary and expenses	3,055 75	
Voss, E. (C. Thomas), salary	100 00	
Wagner, R., scholar, salary	225 00	
Weniger, W., fellow, salary	400 00	
Wilcox, W. G., assistant, salary	500 00	
Wolesensky, E., assistant, salary	500 00	
Wolff, Kubly & Hirsig, hardware	150 22	
Walton, Jr., J. H., assistant professor, salary	1,600 00	
Winchell, A. N., assistant professor, salary	2,000 00	
Wagner, George, instructor, salary, bills paid	1,205 00	
Woodward, Mrs. Cora S., adviser of women, salary	2,200 00	
Williams, F. E., assistant, salary	300 00	
Wolff, H. C., instructor, salary	1,300 00	
Woolley, E. C., instructor, salary	1,100 00	
Wild, E., assistant, salary	700 00	
Weber, A. W., assistant, salary	600 00	
Wiedenbeck, Dobelin & Co., hardware	30	
White, Rhoda M., clerical work	60 00	
Wisconsin Telephone Co., messages	3 35	
Wiswall, E. C., & Son, clay	5 00	
Ward's Nat. Science Establishment, specimens	14 75	
Williams, Browne & Earle, repairs, lens	36 80	
Whitall Tatum Co., bottles, apparatus	51 02	
Western Electric Co., relay, bells, wire, etc.	169 38	
Warner, W. W., tuning	5 00	
Welsbach Co., chemicals	99 50	
Wisconsin Medical Journal, advertising	16 67	
Western Union Telegraph Co., messages	1 80	

Webster, F. S., Co., ribbons, supplies	9 50	
Williams, W. H., professor, salary	500 00	
Whiting Paper Co., paper	2 70	
Watt, H. A., fellow, salary	40 00	
Ward, M., & Co., tinware	1 49	
Western School Journal, advertising	12 00	
Ward, C. H., models, casts	75 60	
Yawkey-Crowley Co., lumber	107 40	
Youker, H. S., expenses	8 97	
Zobel, E. H., scholar, salary	225 00	
Zeiss, C., apparatus	638 53	
Zdanowicz, C. D., instructor, salary	1,000 00	
Zapffe, C., salary	80 00	
Zehnter & Co., toweling, muslin, sheeting	11 44	
		$382,466 88
Harris & Co., deduct account credit		3 98
Total		$382,462 90

COLLEGE OF ENGINEERING

American express Co., express	$59 89	
Atwood, J. T., instructor, salary	1,200 00	
Administration pay roll, clerks, etc	1,344 83	
American Bridge Co. of New York, parts	26 83	
Ayers, A. H., instructor, salary	1,050 00	
American Instrument Co., voltmeter	116 53	
American Rutile Co., chemicals, etc	24 00	
Abbott, E. P., salary	255 19	
Austin, A. E., & Co., boots	11 00	
Aluminum Co., of America, ingots	4 35	
Allis-Chalmers Co., breaker	197 00	
American Steam Gauge Mfg. Co., gauge	25 00	
Andrae, J., & Sons Co., panels	108 00	
Automatic Supply Co., instrument	65 00	
Automobile Supply Co., chain	13 75	
American Meter Co., instruments	7 75	
Bristol Co., charts	2 25	
Blied, F. C., & Co., printing	19 25	
Burger, Peter, hardware	43 01	
Beebe, M. C., associate professor, salary and expenses	2,064 65	
Blied & Schneider, hardware	14 25	
Besly, C. H., & Co., brass, hardware,	234 36	
Burrer, K. O., instructor, salary	800 00	
Baker, R. L., salary	400 00	
Biddle, J. G., apparatus, voltmeter	767 46	
Burnett, E. S., research assistant, salary	550 00	
Burgess, C. F., professor, salary	2,700 00	
Burnside, C. H., assistant professor, salary	1,800 00	
Breckenridge, J. M., salary	225 00	
Bull, Storm, professor, salary	810 00	
Brandel, C. O., salary	229 80	
Bausch & Lomb Optical Co., chemicals	12 00	
Brown & Sharpe Mfg. Co., gears	22 75	
Bouchard, J., electroplating	1 00	
Bishop, J., & Co., wire	20 57	
Bethlehem Steel Co., steel	6 10	
Bliss & Laughlin, shafting	21 87	
Banjamin, C. H., expenses	16 40	
Becker-Brainard Mill Mach. Co., machine	769 50	
Boehm, W. J., instruments	5 50	
Buffalo Dental Mfg. Co., burner	8 10	
C., M. & St. P. Ry. Co., freight	182 66	
Cooper, M. D., salary	75 00	
Cooley, C. F., coal, cement	5,867 91	
Chisholm & Morse Mfg. Co., hoist	30 00	
C. & N. W. Ry. Co., freight	148 36	
Cutler, J. A., salary	130 50	
Cantwell Printing Co., printing, etc	69 80	
Crane Co., pipe, fittings, etc	485 16	
Castle & Doyle, cement, coal, etc	14 55	
Cambridge Sci. Inst. Co., thermometer	88 29	
Capitol City Fuel Co., cement	3 38	
Conklin & Sons, cement	50 00	
City of Madison, water	19 20	
Connersville Blower Co., blower	17 20	
Cleghorn, M. P., salary	175 00	
Channon, H., Co., belt	15 05	
Chatillon, J., & Sons, scale	3 38	

College Book Store, stationery, instruments	24 75	....
Caldwell, H. W., & Son Co., belt	23 50	....
Clow, J. B., & Sons, fittings, separator	22 10	....
Crosby Steam Gage & Valve Co., gages, etc.	15 00	....
Carborundum Co., carbo	6 00	....
Chaplin-Fulton Mfg. Co., valve	12 00	....
Cutler-Hammer Mfg. Co., rheostats	116 28	....
Chapman, L. L., salary	39 90	....
Doyon & Rayne Lbr. Co., lumber	72 52	....
Davis, G. J., Jr., assistant professor, salary and expenses	1,570 67	....
Dickerman, J. C., assistant professor, salary and expenses	1,558 99	....
Dabney, W. L., instructor, salary	900 00	....
Democrat Ptg. Co., printing	43 50	....
Dengler, C. M., lettering	6 50	....
Dietzgen, E., Co., blue print outfit, paper	79 00	....
Diederich, M., merchandise	90	....
Dresen & Rhodes, paints	6 40	....
Dresen, T. F., repairs	5 50	....
Davis, L. L., condensers	33 00	....
Ensign, O. H., professor, salary	3,500 00	....
Egelhoff, R. F., instructor, salary	800 00	....
Electrical Supply Co., supplies, merchandise	156 16	....
Excelsior Supply Co., tubing	3 17	....
Eastman, J. S., merchandise	18 00	....
Equitable Meter Co., meter	15 50	....
Electrical Storage Battery Co., recharges	134 77	....
Eimer & Amend, chemicals	158 31	....
Flammer, E., instructor, salary	1,000 00	....
Felton, A. P., keys, etc.	1 75	....
Foote Mineral Co., minerals	9 00	....
Fair, The, Madison, jars	4 50	....
French Battery & Carbon Co., manganese	7 50	....
Foster, A. M., & Co., prescriptions, glassware	65 38	....
Frederickson, A. D. & J. V., lumber	522 01	....
Fairbanks, Morse & Co., pump, scale, poise	743 90	....
General Electric Co., motor, transformer, etc.	791 53	....
Gattiker, W. A., salary	280 93	....
Garden City Sand Co., quartz	6 00	....
Greig, J., chairs, etc.	225 50	....
Gross, G. L., salary	17 00	....
Gross, P., Hardware Co., hardware	23 40	....
Gallagher, J., Co., use of flags, awning, case	10 76	....
General Chemical Co., cylinders	19 04	....
Goldschmidt Thermit Co., chemicals, minerals	59 55	....
Glencoe Lime & Cement Co., lime	1 00	....
Harloff, P. F., wire	2 00	....
Hammer, M. R., instructor, salary	900 00	....
Harris, S., & Co., fittings, hardware, tools, etc.	25 77	....
Heat and water, percentages	5,485 90	....
Hirsch, A., scholar, salary	225 00	....
Haswell Furniture Co., furniture	43 30	....
Huels, F. W., instructor, salary	1,200 00	....
Hirsch, J. G., salary	91 24	....
Harza, L. F., salary	150 00	....
Houle, A. J., expenses	83 00	....
Huels, F., locks, etc.	1 00	....
Hanson & Van Winkle Co., supplies	19 04	....
Heil, H., Chemical Co., chemicals, weights, etc.	21 35	....
Hollister Drug Co., drugs, etc.	1 30	....
Harris Air Pump Co., pump	90 00	....
Harbison-Walker Refractories Co., brick	58 00	....
Henion & Hubbell, pumps, etc.	803 94	....
Hackendahl & Schmidt Co., stairway	210 00	....
Illinois Electric Co., motors, merchandise	300 35	....
Ives, F. W., salary	25 48	....
International Acheson-Graphite Co., brass, etc.	128 18	....
Illinois Central Ry. Co., freight	62 25	....
Johns-Manville, H. W., Co., paper, tubing, etc.	19 05	....
Jones & Lamson Machine Co., lathe	1,112 75	....
Johnson Service Co., balance on contract	465 00	....
Jones & Laughlin Steel Co., hardware	3 97	....
King & Walker Co., planer, castings, pulleys	235 95	....
Kroncke Bros., hardware	34 09	....
Kommers, J. B., instructor, salary	900 00	....
Knabe Foundry, castings	1 35	....
Kendrick & Davis, motors	12 80	....
Keown, R. McA., instructor, salary and expenses	1,467 55	....
Kroeschell Bros. Ice Machine Co., rent	125 00	....
Kinne, W. S., instructor, salary	1,200 00	....

Kowalke, O. L., instructor, salary	1,000 00	
Kateley, F., assistant, salary	550 00	
Keuffel & Esser Co., transits	624 00	
Kratsch, H., salary	150 00	
Knoblock-Heideman Machine Co., coils	10 55	
La Clede-Christy Clay Pipe Co., brick	27 25	
Loew, E. A., instructor, salary	1,050 00	
Lottes, W. G., instructor, salary	1,200 00	
Leavitt, C. W., & Co., magnesium	45 50	
Leeds & Northrup Co., instruments, cell, apparatus	830 09	
Library Bureau, cards	5 00	
Lunkenheimer Co., valves, fittings	35 67	
Lake, E. J., salary	125 00	
Leffel, J., & Co., turbine	55 00	
Lorenz, E. H. J., mechanician	230 00	
Menges Pharmacy, drugs, etc	20 35	
Mack, J. G. D., professor, salary	2,800 00	
Maurer, E. R., professor, salary	2,558 55	
Miller, A. H., instructor, salary	900 00	
McCullough, F. M., instructor, salary and expenses	1,227 74	
Mead, D. W., professor, salary	3,000 00	
Millar, A. V., instructor, salary	1,350 00	
Mayers, A. A., paints, seeds, merchandise	8 30	
McBride, B. R., instructor, salary	800 00	
Mautz Bros., paints, shades, etc	99 93	
Madison Paint & Wall Paper Co., glass	6 65	
Madison Gas & Electric Co., gas, current and power	1,520 61	
Mineral Products Mfg. Co., acid	12 75	
Moseley, J. E., stationery	9 70	
Metz, A., bell traps	7 00	
Modern Steel Structure Co., beams, etc	20 70	
Machinists' Supply Co., tools	6 08	
Madison & Interurban Traction Co., wire	6 00	
Mechanical Rubber Co., hose	32 30	
Marshall & Huschart Mach. Co., grinder	625 00	
Madison Brass Works, castings	47 19	
Moore, H. F., salary	75 00	
McIntosh, W. H., salary	75 00	
Mueller Co., The, arches	8 30	
Mainland, J., salary	4 25	
Moritz, C., salary	49 00	
Mott, W. R., scholar, salary	67 50	
Morgan, R. V., salary	247 50	
Nielson, E. C., photo work, slides, etc	269 60	
Northern Electrical Mfg. Co., wire, motor, apparatus, etc	239 35	
National Carbon Co., cells, etc	65 10	
Nungesser Electric Battery Co., batteries	10 02	
Niebuhr, E. J., re-caning	1 50	
Norwood Engr. Co., valves	12 00	
Newbury & Peper, iron, packing, belting, etc	26 99	
Nelson & Polk, turpentine	6 00	
Owen, R. S., instructor, salary	1,200 00	
Orford Copper Co., cobalt, etc	26 50	
Parsons Printing & Stationery Co., stationery, printing	80 56	
Post, L. M., mechanician, salary and expenses	884 40	
Primos Chemical Co., metal, chemicals, acid	66 25	
Parker, H. A., salary	300 00	
Price, J. R., instructor, salary and expenses	1,315 20	
Phillips, J. D., professor, salary, posters, etc	2,309 35	
Parker, E. E., instructor, salary and expenses	627 16	
Pickarts, L. J., bursar, postage, bills paid	171 43	
Pence, W. D., professor, salary	2,850 00	
Platt Iron Works, wheel	350 00	
Post Publishing Co., printing	4 50	
Post, H. L., salary	98 36	
Pieh, J. F., sand	7 00	
Paltz, J., cleaning	1 50	
Pelton Water Wheel Co., motor	100 00	
Payton, M., instructor, salary	153 00	
Piper Bros., groceries, etc	80	
Parkinson-Marling Lumber Co., lumber	5 02	
Penn, W. C., instructor, salary	604 20	
Packard, O. L., Machinery Co., pulleys, etc	6 16	
Queen & Co., transits, pump, thermometers	512 80	
Richter, A. W., professor, salary and expenses	2,507 00	
Rundle-Spence Mfg. Co., lead	10 66	
Roessler & Hasslacher Chem. Co., oxone, etc	9 50	
Richards, M., salary	60 00	
Reynolds, E. S., teaming, etc	20 00	

Ryerson, J. T., & Son, rod, etc	3 19	
Sladky, P., assistant, salary	663 72	
Smith, L. S., associate professor, salary	2,200 00	
Steen, J. C., superintendent, salary and expenses	2,050 59	
Store Room, merchandise	25 91	
Strelinger, C. A., Co., supplies, etc	9 50	
Sherman, J. R., salary	154 39	
Sanford, H. B., instructor, salary	800 00	
State Journal Printing Co., bulletins	38 50	
Shealy, E. M., instructor, salary	1,100 00	
Shuster, J. W., assistant professor, salary	1,600 00	
Sears, Roebuck & Co., tools, lens, etc	33 29	
Schutte & Koerting Co., pump comp	7 80	
Sinaiko Bros., beams, shaft	3 10	
Schaeffer & Budenberg Mfg. Co., gage, repairs	42 25	
Standard Calorimeter Co., apparatus	127 30	
Sunbeam Incandescent Lamp Co., lamps	8 40	
Sumner & Morris, hardware	19 40	
Sargent, E. H., & Co., supplies, apparatus, etc	374 50	
Stewart, C. B., research assistant, salary	1,159 14	
Steel, A. A., expenses	41 65	
Schultz & Knabe, castings, etc	44 65	
Standard Paper Co., paper	21 37	
Shorey, E. R., salary	11 40	
Sholes, C. E., Co., chemicals	36 40	
Sheets, George, repairs	2 25	
Stock, H. H., expenses	64 35	
Summers, L. L., salary	250 00	
Scrugham, J. H., salary	100 00	
Small, W. T., salary	100 00	
State of Wisconsin, insurance	621 80	
Stephens, D., stone	18 50	
Sumner & Son, drugs	11 75	
Turneaure, F. E., dean and professor, salary and expenses	4,419 47	
Thorkelson, H. J., assistant professor, salary	1,800 00	
Tracy, Gibbs & Co., printing	141 50	
Thiele, O. V., salary	30 00	
Thordarson Elect. Co., transformer	490 00	
Titusville Forge Co., bar	74 75	
Thermal Syndicate, Ltd., apparatus	51 84	
Toch Bros., paint	6 25	
Thompson, A. T., & Co., rheostat, lenses	14 29	
Trump Mfg. Co., wheel	225 00	
United States Express Co., express	59 22	
University pay roll, janitors, etc	7,516 93	
University Cooperative Co., stationery, cloth, etc	72 07	
Vosskeuhler, J. H., assistant professor, salary	1,500 00	
Van Zandt, J. G., instructor, salary	1,000 00	
Vilter Mfg. Co., machine, coils, valve	248 45	
Virginia Electrolytic Co., calcium	105 00	
Wiedenbeck, Dobelin & Co., hardware	42 28	
Wied, J. C., instructor	821 00	
Watts, O. P., instructor	1,400 00	
Warner, F. M., instructor, salary	800 00	
Whitall-Tatum Co., bottles	7 95	
Wickenden, W. E., instructor, salary and expenses	1,025 82	
Watson, J. W., instructor, salary	1,550 00	
Wolff, Kubly & Hirsig, hardware	226 21	
Wisconsin Telephone Co., messages, rentals, etc	8 55	
Western Union Telegraph Co., messages	13 99	
Withey, M. O., instructor, salary	1,478 86	
Wadsworth, W. J., salary	177 00	
Weston Electrical Inst. Co., voltmeters, ammeters	569 91	
Wheeler, C. H., Mfg. Co., condenser	235 00	
Wood, B. S., instructor, salary	750 00	
Wisconsin Bridge & Iron Co., fittings	46 70	
Wilmore, J. J., salary	150 00	
Wagner Electrical Mfg. Co., motor	156 59	
Webster Mfg. Co., boxes	4 00	
White, S. S., Dental Mfg. Co., oxygen, cylinder	23 00	
Williams, L. D., instructor, salary	960 00	
Williams, Brown & Earle, apparatus	147 00	
Wissler Instrument Co., levels	565 00	
Wisconsin Engineer, advertising	25 00	
Westinghouse Elect. & Mfg. Co., ammeters, watt-meter, etc.	801 76	
Weber, F. C., aluminum	15 25	
Wilson-Maeulen Co., apparatus	197 90	
Yawkey-Crowley Lumber Co., lumber	250 58	
Yager, R. M., salary	47 85	
Total		$130,012 70

ADMINISTRATION		
Administration pay roll, clerks, stenographers, etc.	$17,343 53	
Angell, E. D., expenses	50 00	
American Express Co., express	7 47	
Burdick & Murray Co., ribbon	13 75	
Burroughs Adding Machine Co., stand, etc.	1 00	
Brown, H. H., sack	1 00	
Buckstaff, Mrs. Florence G., expenses	55 84	
Buell, H. C., expenses	24 85	
Cantwell Printing Co., printing	160 00	
C. M. & St. P. Ry. Co., freight	1 88	
Capital City Paper Co., paper, twine	41 77	
Chicago Envelope Co., envelopes	20 20	
Capital City Paper Co., paper	2 56	
City of Madison, water	7 99	
Cary, C. P., dictionary	7 50	
C. & N. W. Ry. Co., freight	9 17	
Cooley, C. F., coal	254 07	
Dengler, C. M., lettering	50	
Dennison Mfg. Co., seals	1 83	
Dane County Title Co., recording	4 00	
Democrat Printing Co., printing	46 00	
Evans, Dr. Edw., expenses	165 00	
Elmore, J. H., expenses	60 28	
Fink, B. E., expenses	30 94	
Field & Co., Marshall, mdse.	2 00	
Fewson, E., expenses	18 90	
Grimm's Bindery, binding	34 25	
Hoard, W. D., expenses	61 95	
Haswell Furn. Co., furniture	2 75	
Heat and Water, percentages	238 51	
Jones, Jas. Ll., expenses	57 84	
Keller, Gustave, expenses	44 66	
Keeley, Neckerman & Kessenich, mdse.	2 75	
Library Bureau, cards	106 80	
Lockwood Trade Journal, directory	3 00	
McCaffrey, M. E., secretary, car fare, expenses	55 98	
McConnell, J. E., expenses	39 03	
Merrill, George F., expenses	155 15	
Madison Gas & Electric Co., gas and current	102 02	
Mason, E. C., accounting	5 00	
McElroy, W. J., expenses	93 50	
Mead, M. C., expenses	60 50	
Moseley, Jas. E., paper	53 60	
Nelson, A. P., expenses	133 90	
National Assoc. of State Universities, fee	10 00	
Nielson, E. C., slides	13 50	
Norcross, Pliny, expenses	7 35	
Paper Mills Co., The, paper	18 30	
Puls, A. J., expenses	36 45	
Piper Bros., groceries	20	
Post Publishing Co., The, ledger	16 00	
Pickarts, L. J., bursar, postage	1,025 15	
Postal Telegraph Co., messages	29	
Parsons Printing & Stationery Co., stationery, printing	617 87	
Prescott, A. C., expenses	43 08	
Rockwell-Wabash Co., cases	4 88	
Remington Typewriter Co., rentals, repairs	19 20	
Shea, Smith & Co., books	7 65	
Smith Premier Typewriter Co., repairs	8 55	
Sewell-Clapp Mfg. Co., envelopes	172 32	
Standard Paper Co., paper	80 40	
State Journal Printing Co., printing	39 08	
Simonson & Co., R. A., guides	1 50	
Saffle, C. A., stationery	2 00	
Schwaab Stamp & Seal Co., seal	1 75	
Store room, mdse.	45 55	
Standard Adding Machine Co., ribbon	1 00	
Taylor & Gleason, printing	8 50	
Tracy, Gibbs & Co., printing	380 00	
U. S. Express Co., express	1 45	
University Pay Roll, clerks, janitors	79 64	
Van Hise, C. R., President, salary	6,500 00	
Van Hise, C. R., expenses	1,056 66	
Whiting Paper Co., paper	4 50	
Webster Co., F. S., ribbons	5 50	
Western Union Telegraph Co., messages	4 56	
Wisconsin Telephone Co., messages	1 25	
Youker, H. S., expenses	46 88	
Total		$29,971 88

LABORATORIES

Agar Baugh, J. H., tape	$28 33	
American Express Co., express	254 19	
The American Society of Civil Engineers, books	2 81	
Andrus & Church, paper	4 62	
Administration pay roll, clerks	52 31	
Averbeck, F. A., repairs	5 50	
Ashcroft Mfg. Co., screws, pistons	8 42	
Alford Bros., laundry work	6 30	
Angell, E. D., expenses	22 68	
American Electrochemical Society, book	2 00	
Anglers Bait & Mfg. Co., frogs	10 77	
Bliss & Laughlin, fittings, rods	39 49	
Biddle, J. G., batteries, electrolyte	422 10	
Burtis Co., The R. M., copper	9 27	
Burdick & Murray Co., mdse.	22 72	
Bishop & Co., J., crucibles, etc.	56 05	
Bradley, H. C., expenses	41 97	
Boehm, W. J., instruments	16 50	
Blackwelder, E., expenses	8 73	
Baumbach, Reichel Co., ammonia	55 62	
Burrowbridge, J., drayage	2 50	
Besly & Co., Chas. H., steel	71 14	
Burger, P., hardware	25 99	
Boardman, E., instruction	20 00	
Blied & Schneider, hardware	27 14	
Boker & Co., H., tape	3 24	
Buchanan, W. P., photo mateial	2 82	
Buckeye Elect. Co., lamps	1 70	
Brockhaus, F. A., books	4 90	
Bleyer, W. G., instruction	12 00	
Barrett & Co., M. L., chemicals	1 05	
Bardeen, C. R., expenses	21 58	
Beatty, Arthur, instruction	33 50	
Bausch & Lomb Optical Co., lens, chemicals, apparatus	367 47	
C. & N. W. Ry. Co., freight	328 70	
C. M. & St. P. Ry. Co., freight	443 56	
Clow & Sons, J. B., pipe	11 05	
Conklin & Sons, coal, cement	168 52	
Carborundum Co., carbon grains	2 25	
Cambridge Botanical Supply Co., specimens	8 65	
Cramer Dry Plate Co., G., apparatus	15 14	
Chicago Calcium Light Co., oxygen, gas	30 00	
Chicago Pneumatic Tool Co., charts	15 00	
Capital City Green House, flowers, plants	51 55	
Cutler-Hammer Mfg. Co., box	6 84	
Cardinal Creamery Co., milk	3 79	
Curries Bros. Co., seeds	1 50	
Curtis Co., D., zinc	9 00	
Cassier Mag. Co., The, periodical	1 00	
Cantwell Printing Co., printing	30 20	
Cooley, C. F., lime	67 99	
Chicago Brass Co., tube	3 50	
Columbia Tool Steel Co., steel	43 06	
Castle & Doyle, cement, coal, lime	95 01	
Chicago Steel Tape Co., tapes	24 00	
Capital City Fuel Co., coal	32 00	
Crandall Packing Co., packing, etc.	17 38	
Crucible Steel Co., tools	68 39	
Chapman, L. L., book	2 78	
Capital City Paper Co., paper	1 44	
Columbia Phonograph Co., parts	9 26	
Cambridge Scientific Instrument Co., apparatus, etc.	363 25	
Crosby Steam Gage Co., whistle, links, gages	26 87	
Carpenter & Co., G. B., packing	17 00	
Crane Co., pipe, etc.	85 37	
Conger, J. L., instruction	5 00	
Darling, F. E., rabbits	9 00	
Detroit Lubricating Co., parts, brass	6 98	
Diederich, M., groceries, gasoline	31 34	
Duval, E. P. R., instruction	37 63	
Dick Co., A. B., stencil paper	5 60	
Dietzgen Co., E., rods, maps, tracing cloth	136 74	
Dilworth, J. F., instruction	10 00	
Dunbar, Frances J., lantern slides	17 00	
Dengler, C. M., lettering	9 85	
Duluth Corrugating & R. Co., The, boxes	12 00	

Dickinson, T. H., instruction	10 00	
Dresen, Theo. F., repairs	3 25	
Dennison Mfg. Co., labels	20 22	
Denniston, R. H., instruction	10 00	
Doyon & Rayne Lumber Co., lumber	18 67	
Driver-Harris Wire Co., wire	7 71	
Dreer, H. A., supplies, seeds	5 37	
Daigger & Co., A., tubing	41 67	
Democrat Printing Co., printing	38 70	
Eimer & Amend, weights	4,574 10	
Engineering Magazine, The, publication	2 00	
Eastman Kodak Co., velox	2 34	
Erlanger, Joseph, expenses	10 48	
Eastman, J. S., mdse.	14 71	
Excelsior Supply Co., tubing	2 72	
Eastman, F. R., batteries	60	
Engelhardt, C., foil, instruments	70 73	
Electrical Accessories Co., apparatus	4 25	
Emmett Mfg. Co., vise	8 00	
Excelsior Shoe Store, boots, umbrellas	7 00	
Ester Oyster Co., fish	2 81	
Efanden Co., The, lamps	4 00	
Ellwood Ivins Tube Works, tubing	6 89	
Electrical Supply Co., mdse.	230 34	
Elliott, E. C., instruction	5 00	
Frederickson, A. D. & J. V., lumber	260 79	
Fauerbach Brewing Co., gas	24 00	
Felton, A. P., keys	8 15	
F. F. F. Laundry, laundry work	6 14	
Fairbanks, Morse & Co., apparatus, tools	12 00	
Findlay & Co., salt, etc.	43	
Filer & Stowell Co., repairs	26 98	
Findorff, J. H., stands	6 00	
Field & Co., Marshall, toweling, mdse.	219 68	
General Electric Co., motor, switch, parts	6 17	
Goodnight, S. H., lectures	116 53	
Gross Hardware Co., P., keys	12 90	
Gisholt Machine Co., castings	80 42	
Gaertner Co., Wm., table	25 40	
Gilbert, E. M., expenses	4 55	
Gilbert & Anderson, repairs	6 50	
Gurley, W. & L. E., instruments, compasses	49 35	
Goodyear Rubber Co., tubing	6 38	
Gamm, W. J., watch	21 50	
Gilman, S. W., instruction	30 00	
Gallagher Co., J., covers, canvas	2 25	
Gould, Wells & Blackburn, mdse.	35 75	
Grasselli Chemical Co., The, chemicals, acid, etc.	557 47	
Grimm's Book Bindery, binding	36 15	
Grimes, N. C., instruction	120 39	
Harris & Co., S., fittings	199 94	
Hess, R. H., instruction	17 00	
Haak, Jr., Wm., leather, hose, belting	12 07	
Heil Chemical Co., H., thermometer, checimals, etc.	52 37	
Hollister Drug Co., drugs, chemicals	213 81	
Halbach, J. P., belting	3 20	
Haage & Schmidt, seeds	1 65	
Huels, Fred, locks, keys	20 78	
Henion & Hubbel, ejector	9 00	
Harloff, P. F., solder	57 17	
Haak, Arno, instruments	21 35	
Halle, Bernard, instrument	13 34	
Hoskins Co., The, furnace	30 60	
Hokanson Automobile Co., batteries	1 50	
Hammacher, Schlemmer & Co., tools	17 31	
Haswell Furniture Co., furniture	1 75	
Huntington, E. A., instruction	15 00	
Hoffman Feed Co., oats	5 80	
Haussmann, J. F., instruction	67 00	
Heinzkill, J., soap	2 92	
International Acheson Graphite Co., electrodes	7 66	
Ide & Sons, A. L., piston rings	7 00	
Illinois Glass Co., vials	11 97	
International Harvester Co., repairs	9 33	
Illinois Central Ry. Co., freight	134 96	
Ingersoll-Rand Co., oil	2 50	
Illinois Paper Box Co., boxes	20 52	
Illinois Electric Co., motors	61 00	
Jones & Laughlin Steel Co., steel	76 29	

Jeffrey Mfg. Co., The, instruments	9 60	....
Johnson & Johnson, cabinet	6 00	....
Jarvis, C. W., drayage	3 00	....
Johns-Mansville Co., H. W., paper, board	11 00	....
Jardot, Agnes, pigs	7 00	....
Keeley, Neckerman & Kessenich, mdse., towels	2 75	....
Kohl, Max, apparatus	257 73	....
Kernan Paper Co., paper	10 50	....
Krantz, Dr. F., specimens	56 35	....
Kornhauser Co., A., towels, mdse.	20 57	....
Kny-Scheerer Co., The, skeletons	3,741 17	....
Keown, R. McA., instruction	2 50	....
Klueter & Co., oats, etc.	4 55	....
Kroncke Bros., hardware	83 46	....
King & Walker Co., castings	106 74	....
Keuffel & Esser Co., instrument, rods	65 40	....
Koniglichen Porzellen Manf., apparatus	50 70	....
Lunkenheimer Co., cups	6 48	....
Lorenz, E. H. J., mechanician	90 64	....
Leeds & Northrup Co., The, instruments, repairs	47 90	....
Leith, C. K., expenses	17 29	....
Leitz, Ernst, supplies, chemicals, vials	357 20	....
Lufkin Rule Co., The, tapes	20 25	....
Lambert, F. D., specimens	30 00	....
Lindeman & Hoverson, A. J., specimens	51 91	....
Leybold's Nachfolger, E., apparatus	77 35	....
Lentz & Sons, C., sharpening	16 93	....
Madison Paint & Wall Paper Co., paints, brushes	4 15	....
Minch, H. J., feed	26 06	....
Mautz Bros., paints, shades	92 89	....
Menges Pharmacy, drugs	53 85	....
Meltzer, W. J., lead	10 92	....
Mechanical Rubber Co., tubing	14 00	....
Mead, W. J., expenses	6 90	....
Machinists Supply Co., tools	6 38	....
Martin, L., expenses	3 30	....
Martyn & Doolittle, book	1 80	....
McClurg & Co., A. C., books	319 38	....
Marine Biological Laboratory, specimens	43 25	....
Metz, A., pipe	2 25	....
Mayers, A. A., mdse.	34 47	....
M. A. Seed Dry Plate Co., plates	10 56	....
Madison Brass Works, castings	24 89	....
Muller-Uri, Richard, tubes, etc	76 59	....
Moseley, J. E., stationery	55 95	....
McAllister Co., T. H., oxylithe	2 70	....
McConachie, L. G., instruction	20 00	....
Meier & Kelly, groceries	2 04	....
Mohr, C. L., printing	42 20	....
Moore & White Co., filling	8 05	....
Maurer, E. R., instruction	9 00	....
Madison Gas & Electric Co., gas and current	1,051 30	....
Moss, Leon, lettering	29 95	....
Madison Steam Laundry, laundry work	12 05	....
Norwood, J. N., instruction	5 00	....
New England Water Works Assn., journal	1 00	....
Nernst Lamp Co., glowers, ballasts	49 34	....
Nelson & Polk, alcohol	2 70	....
Nelson, E. C., slides	20 00	....
Niebuhr, Emil, painting	4 00	....
Nielson, A., necturns	7 20	....
Northwestern Mfg. Co., brushes	8 06	....
Newton, Geo. C., timber	7 20	....
New York Store, merchandise	16 45	....
National Meter Co., meters	60 00	....
Newbury & Peper, belting, supplies	117 46	....
Newton & Co., instruments	2 70	....
Norton Co., emery wheel	1 04	....
Neostyle Co., stencil	5 00	....
Nelson, O. M., solder	2 25	....
National Distilling Co., alcohol	252 70	....
National Carbon Co., carbon	6 70	....
Northern Electric Mfg. Co., shafting, apparatus, etc	66 50	....
O'Shea, M. V., instruction	51 00	....
Olson, J. E., lectures	38 06	....
Owens, William, plumbing	1 97	....
Otto, Max, instruction	10 00	....
Obermayer Co., S., tools	39 07	....
Olds, H. A., wire	8 50	....

O'Brien & Scanlon, cartage	2 00	
Pitman, Annie, instruction	30 00	
Owen, Theo., vents	4 75	
Patterson, D. L., instruction	10 00	
Pickarts, L. J., bursar, bills paid	122 68	
Peek & Velsor, seeds	2 49	
Parker Co., Chas., slide	2 40	
Packard Machine Co., O. L., machinery	13 98	
Peterson & Co., L., boxes	13 00	
Pritzlaff Hardware Co., J., hatchets	6 73	
Prokosch, E., instruction	21 00	
Pitman Dry Goods Co., dry goods	3 90	
Piper Bros., mops	130 43	
Paines Lumber Co., lumber	21 77	
Post, L. M., salary, car fare	18 67	
Parsons Printing & Stationery Co., stationery	179 63	
Pieh, J. F., sand	26 00	
Phillips, J. D., instruction	60 00	
Quaker City Rubber Co., lacing	1 60	
Riverside Mills, waste	48 48	
Rich, Fred A., Agt., gages	25 36	
Ross, E. A., expenses	48 84	
Rivett-Dock Co., tool	4 20	
Rhodes & Co., James H., calcium chloride	11 70	
Roe Stephens Mfg. Co., gate	13 75	
Ryerson & Co., J. T., iron	92 90	
Red Wing Union Stoneman Co., clay	5 90	
Robinson, C. M., reports	6 50	
Roessler & Hasslacher Chemical Co., acid	8 50	
Schultz & Knabe, coke	142 08	
Standard Paper Co., paper	41 25	
Schuyler & Co., J. R., traps	2 75	
Steeg & Reuter, Dr., apparatus	55 11	
Saffle, C. A., stationery	2 50	
Steinheil Sohne, C. A., telescope	532 12	
Schaeffer & Budenberg Mfg. Co., gauge, instruments	51 05	
Snyder, Matilda L., mimeograph work	25 00	
Shower, H. F., hauling	2 25	
Stoelting Co., C. H., hardware, apparatus	1,334 45	
Snow, B. W., car fare	12 00	
Slocomb & Co., J. T., tools	7 70	
Smongesky & Co., A. L., frogs	1 00	
Sladky, P., assistant, machine shop, salary	29 80	
Sumner & Crampton, drugs	35 00	
Sandusky Portland Cement Co., sand	1 75	
Smith, L. S., expenses	248 73	
Sumner & Son, E., drugs	28 87	
Standard Adding Machine Co., paper	3 25	
Scheler Bros., meats	41 26	
Showerman, Grant, lectures	120 00	
Small & Stevens Co., shot	8 30	
Stephens, David, stone	8 43	
Schwoegler & Bliss, plumbing	25	
Schmidt & Haensch, microscope	74 04	
Stehr, Wm., meats	4 35	
Smith Steel Casting Co., G. H., yoke	19 68	
Sargent & Co., E. H., chemicals	460 06	
Street Railway Journal, subscription	6 50	
Stechert & Co., G. E., books	797 33	
Sumner & Morris, hardware	108 92	
Standard Oil Co., oil	13 18	
Schlatter, E. B., instruction	40 00	
Schlimgen, F. M., marble	5 50	
Smith, E. R., instruction	64 37	
Shriner Bros., box	16 00	
Strelinger Co., C. A., vise part, glue, bits	19 13	
Schoelkopf, L. F., pump	6 00	
Scientific Shop, The, books, thermometers	53 23	
Sinaiko Bros., lead	5 00	
Schmidt, Wm., repairs	7 80	
Spencer Lens Co., dishes, razors, slides	113 31	
Scovill Mfg. Co., brass tube	4 42	
Store room, mdse.	16 46	
Starrett Co., L. S., indicators	6 50	
State Journal Printing Co., printing	7 50	
Taylor Bros. Co., thermo	28 80	
Thompson & Co., A. T., rheostat	1 66	
Truax, Greene & Co., skeletons	133 00	
Toch Bros., varnish	1 50	
Thompson & Sons, J., gasoline, fittings	10 70	

Thomas Co., A. H., boxes	6 60	
Tagliabue Mfg. Co., C. J., case	30 00	
Tracy, Gibbs & Co., printing	81 50	
Thorburn Co., J. M., seeds, plants	4 92	
University of Chicago Press, journals	8 60	
University of Wisconsin Boathouse Co., rent of boats	7 20	
United States Electrical Tool Co., grinder	32 00	
Underwood Typewriter Co., paper, etc.	36 85	
University Cooperative Co., stationery	150 38	
United States Express Co., express	134 25	
University pay roll, janitors, clerks	5,164 19	
Vaughans Seed Store, seeds	10 68	
Viscosity Oil Co., oil	156 48	
Valvoline Oil Co., oil	97 06	
Van Schaak & Sons, P., chamois	25 11	
Wiedenbeck, Dobelin & Co., waste	216 25	
Wolff, Kubly & Hirsig, hardware	171 69	
Wilson-Mauelin Co., apparatus, tool	4 30	
Whitall Tatum Co., paper, apparatus, jars	194 10	
Williams Co., D., subscriptions	4 00	
Wagner Electric Mfg. Co., weights	10 13	
Western Foundry Supply Co., manganese	4 00	
Wolff, H. C., instruction	78 50	
Warner, W. W., bows	9 00	
Wisconsin Telephone Co., messages	5 85	
Westerdijk, Dr. J., fungi	3 90	
Western Electrician, subscription	2 00	
Wahl-Henius Institute, chemicals	1 50	
Wildman, E. E., ascaris	10 50	
Western Union Telegraph Co., messages	4 93	
Wausau Quartz Co., quartz	6 00	
Wisconsin Engineer, publications	22 45	
Weston Electrical Instrument Co., ammeters, repairs	240 08	
Whitney Electrical Instrument Co., repairs	6 10	
Williams & Peters, coal	127 58	
Ward & Co., M., microscope, apparatus	15 75	
Western Electric Co., rubber, lamps	44 05	
White Dental Mfg. Co., S. S., apparatus	1 87	
Winchell, A. N., expenses	17 96	
Wadhams Oil Co., waste	21 42	
Whitcomb, R. C., delivering body	7 80	
Westinghouse Elect. & Mfg. Co., transformers	9 42	
Woolley, E. C., instruction	146 83	
Yawkey-Crowley Lumber Co., lumber	60 87	
Zeiss, Carl, instruments	44 90	
Total		$82,065 57

COLLEGE OF LAW

American Express Co., express	81 77	
American Law Book Co., books	17 40	
American Law Register, subscription	6 00	
Association of Amer. Law Schools, dues	20 00	
Administration pay roll, clerks	1,539 00	
Boston Book Co., books	1,093 75	
Bashford, R. M., professor, salary	1,000 00	
Banks Law Pub. Co., books	91 97	
Bender & Co., M., books	16 50	
Bordwell, P., expenses	31 27	
Bancroft-Whitney Co., book, reports	10 00	
Cook, W. W., professor, salary	3,050 00	
City of Madison, water	4 00	
Cooley, C. F., coal	762 23	
C. & N. W. Ry. Co., freight	2 27	
Crane Co., pipe	1 05	
Chapman Co., T. A., carpet	181 58	
Callaghan & Co., books, subscriptions, reports	718 47	
C. M. & St. P. Ry. Co., freight	10 97	
Cantwell Ptg. Co., printing	3 25	
Dresen & Rhodes, paints	2 50	
Dengler, C. M., lettering	2 00	
Flood & Co., T. H., book, balance contract	210 00	
Electrical Supply Co., mdse.	16 84	
Democrat Printing Co., printing	5 75	
Grimm's Bindery, binding	41 55	
Gaylord Bros., supplies	3 30	
Gilmore, E. A., professor, salary	3,000 00	
Hinton, E. D., expenses	39 15	
Heat and Water, percentages	715 58	
Johns-Manville Co., covering	97 27	

Jones, G. I., books	5 00	
Jones, B. W., salary	890 00	
Keefe-Davidson Co., subscription, book	13 00	
Loeb, Max, printing	2 40	
Libbie & Co., C. F., book	11 75	
Lawyers Co-op Pub. Co., books	45 00	
Menges Pharmacy, drugs	15	
Mautz Bros., paints	55 60	
Martindale Merc. Agency, The, subscription	10 50	
MacMillan Co., The, books	1 50	
Moseley, J. E., stationery	12 50	
McClain, Emlin, salary	800 00	
Madison Gas & Elec. Co., gas and current	266 14	
Owens, Wm., plumbing	1 00	
Olin, J. M., lecturer salary	960 00	
Parsons Printing & Stationery Co., stationery	52 03	
Post Pub. Co., printing	51 83	
Pickarts, L. J., bursar, bills paid, postage	32 64	
Richards, H. S., dean and professor, salary and expenses	3,908 70	
Reed, Adams & Co., subscription	3 00	
Standard Paper Co., paper	6 05	
State of Wisconsin, insurance	207 27	
Smith, H. L., professor, salary	3,500 00	
Shepard Co., The Frank, books	5 50	
Sumner & Morris, hardware	1 88	
Store room, mdse.	5 80	
Statute Law Book Co., books	137 22	
Tracy, Gibbs & Co., printing	10 75	
Thompson & Co., E., book	13 75	
University pay roll, janitors	740 82	
University Co-op Co., stationery	25	
U. S. Express Co., express	2 55	
Western Union Telegraph Co., messages	50	
Wittl, A. A., printing	2 75	
West Publishing Co., books	258 75	
Ward Bros., binders	10 10	
Total		$24,722 08

PHYSICAL CULTURE, MEN

American Express Co., express	$0 45	
Administration pay roll, clerks, etc.	105 00	
Alford Bros., laundry	145 94	
Allison Co., W. D., cabinet	30 00	
Angell, E. D., assistant professor, salary	1,500 00	
Burger, Peter, hardware	3 65	
Briggs, Geo. W., changing locker combination	25 00	
Bristol-Myers Co., dressing	1 10	
Barry, T. A., coach outdoor athletics, salary	750 00	
Cooley, C. F., coal	3,557 11	
Cantwell Printing Co., printing	4 75	
C. & N. W. Ry. Co., freight	4 18	
Crane Co., pipe and fittings	23 90	
Clow & Sons, James B., iron	18 22	
City of Madison, water	22 12	
C. M. & St. P. Ry .Co., freight	6 50	
Collyer's Pharmacy Co., life preservers	13 40	
Dresen, Theo. F., repairs	5 10	
Dieges & Clust, placques	180 00	
Diederich, M., mdse.	60	
Democrat Printing Co., printing	16 50	
Eastman, S., wire	7 50	
Elsom, J. C., professor, salary	1,800 00	
Frederickson, A. D. & J. V., lumber	118 64	
Fair, The (Madison) cans	98	
Faber, M. E., labor	2 50	
Heat and Water, percentages	3,339 27	
Haswell Furniture Co., furniture	33 00	
Hutchins, C. P., professor, salary	900 00	
Hollister Drug Co., drugs	25 77	
Halbach, J. P., nets, etc.	2 00	
Hutchins, C. P., professor, salary	2,100 00	
Huels, F. W., locks	2 00	
Huber Co., H., repairs	3 50	
Ill. Cent. Ry. Co., freight	80	
King & Walker Co., pulleys, weights, etc.	27 80	
Kroncke Bros., hardware	6 20	
Madison Gas & Electric Co., gas and current	495 83	
Mautz Bros., paints	91 85	

Madison Paint & Wall Paper Co., paints	21 10	
Moseley, J. E., stationery	4 00	
Myers & Bro., F. E., pump	5 70	
Mayers, A. A., paints	2 00	
Menges Pharmacy, drugs	2 50	
Narragansett Machine Co., lockers	64 00	
Owens, Wm., plumbing	3 00	
Otts' Pharmacy, drugs	3 75	
Pickarts, L. J., bursar, postage	33 50	
Partridge & Co., H., athletic goods	146 55	
Postal Telegraph Co., telegrams	17 12	
Piper Bros., groceries	55	
Parsons Printing & Stationery Co., stationery	26 85	
Store Room, mdse.	1 34	
State of Wisconsin, insurance	331 62	
Scanlan-Morris Co., apparatus	12 50	
Sumner & Cramton, drugs	60 50	
Sumner & Morris, hardware	7 25	
Tracy, Gibbs & Co., printing	37 50	
Ten Eyck, E. H., instructor, salary	1,600 00	
United States Express Co., express	1 20	
University pay roll, janitors, etc.	2,364 37	
University Cooperative Co., stationery	88 60	
Wiedenbeck, Dobelin & Co., hardware	49	
Wehrmann, Chas., repairs	3 45	
Wolff, Kubly & Hirsig, hardware	7 12	
Yawkey-Crowley Lumber Co., lumber	126 18	
Total		$20,343 96

PHYSICAL CULTURE, WOMEN

Atkinson, E. E., instructor, salary	$600 00	
Alford Bros., laundry	74	
American Express Co., express	2 05	
American Gymnasia, apparatus	5 45	
Blickensderfer Mfg. Co., typewriter, carriage	54 50	
Burdick & Murray, mdse.	5 10	
Cantwell Ptg. Co., printing	14 25	
Castle & Doyle, lime, etc.	30	
C., M. & St. P. Ry. Co., freight	4 95	
Democrat Ptg. Co., printing	8 10	
Esser, Mrs. L., pennant, banners	9 00	
Friedenker Pub. Co., books	1 50	
Frederickson, A. D. & J. V., lumber	6 40	
Geyer, D., labor	2 20	
Haswell Furniture Co., furniture	43 05	
Henderson & Co., Peter, roller	25 00	
Jonas Bros., mdse.	6 91	
Kroncke Bros., hardware	90	
Kornhauser Co., A., mdse.	4 15	
Lyon & Healy, music	3 79	
Moseley, J. E., stationery	5 00	
Merrick, Jessie B., assistant, salary	600 00	
Mayhew, Abby S., assistant professor, salary	1,600 00	
Narranganset Machine Co., lockers	49 16	
Pickarts, Mary E., assistant, salary	500 00	
Parsons Printing & Stationery Co., printing, stationery	8 15	
Pieh, F., sand	2 00	
Piper Bros., groceries	95	
Pickarts, L. J., bursar, postage	7 60	
Shelton Electric Co., mdse.	28 80	
Store Room, mdse.	1 00	
Standard Paper Co., paper	2 45	
Tracy, Gibbs & Co., printing	3 25	
University Cooperative Co., stationery	33 75	
University pay roll, janitors, etc.	197 21	
Vaughan's Seed Store, hose	16 00	
Total		$3,844 75

GENERAL ACCOUNT

Administration pay roll, clerks, etc.	$3,545 59	
American Express Co., express	140 87	
Alumni Association of University, aid	100 00	
American Crayon Co., crayons	9 25	
Alford Bros., laundry work	9 85	
Arion Orchestra, music	45 00	
Association of American Universities, assessment	40 00	

Allen, C. E., expenses	37 07	
Apter Typewriter Supply Co., carbon paper	3 50	
Albers, Wm., interest	550 00	
Armour Glue Works, glue	18 00	
Association of American Agricultural Colleges, fee	15 00	
Aitchison, Mrs. L., interest	500 00	
Andrews Co., A. H., erasers, castings	41 65	
Bunde & Upmeyer Co., engraving	90 00	
Bausch & Lomb Opt. Co., apparatus	285 25	
Bardsley, Wm., gear	53 00	
Burdick & Murray Co., mdse., toweling, mat	18 23	
Bourer Co., F. A., paper, enamel	371 25	
Bailey, Banks & Biddle Co., proofs	2 50	
Blied & Schneider, hardware	46 75	
Black, H. A., brooms	33 75	
Burger, Peter, hardware	52 69	
Bouchard, Jos., electroplating	4 15	
Bauhs, Wm., hay	6 53	
Bach, Hugo, music	470 00	
Bleyer, W. G., assistant professor, salary	214 93	
Bolzt, Bertha, laundry	52 37	
Badger, The 1908, Badgers	1,050 00	
Backhaus, L., use of grader	6 00	
Capital City Paper Co., paper	178 22	
Cret, Paul P., plans	1,005 30	
Cooley, C. F., coal	77 31	
Comstock, G. C., director and professor, salary	600 00	
C. & N. W. Ry. Co., freight	127 10	
Cantwell Printing Co., printing	623 00	
Castle & Doyle, cement	158 72	
Clark Engraving Co., cuts	5 18	
Cairns, W. B., fare	8 55	
Cudahy Packing Co., The, soap powder, bar	20 00	
Carter Crume Co., stationery	35 00	
City of Madison, brick	20 00	
Cunliffe, J. W., expenses	15 76	
Conklin & Sons, ice	554 32	
Capital City Green House, rent of palms	15 50	
Crosby Steam Gage Co., chime whistle	55 00	
Conlin, D. F., drayage	24 61	
Clow & Sons, J. B., motor, pipe, etc.	108 82	
Crane Co., pipe and fittings	45 41	
College of Engineers, Vr. No. 1424	24 90	
C. M. & St. P. Ry. Co., freight	22 95	
Diederich, M., groceries, mdse.	3 95	
Dane County Telephone Co., rentals	90 00	
Doyon & Rayne Lumber Co., lumber	8 54	
Dowling, L. W., expense	17 83	
Dengler, C. M., lettering	3 70	
Dane County Title Co., recording, rentals	486 00	
Davis Co., John, lead, etc.	22 71	
Davis, R. W., condemnation proceedings	20 00	
Dickinson Co., A., seed	24 94	
Daily Cardinal, advertising, Cardinals	254 00	
Diepold, P. J., shoeing, repairs	11 00	
De Pere Tablet Co., books	377 70	
Dahl, A. H., state treasurer, interest	1,327 98	
Dearborn, W. F., traveling expenses	3 12	
Democrat Printing Co., printing	265 25	
Engelhardt, M., cloth	31 97	
Electric Supply Co., mdse.	50 97	
Evening Wisconsin, printing	283 65	
Elliott, E. C., expenses	12 71	
Frederickson, A. D. & J. V., lumber	93 37	
Felton, A. P., keys	34 95	
Field & Co., Marshall, mdse.	32 51	
Fox Machine Co., dado head	36 80	
F. F. F. Laundry, laundry	1 42	
Findorff, J. H., carpenter work	1 50	
Fischer, Carl, music	4 97	
Fergen, P., hay	11 45	
Fiske, G. C., expenses	5 54	
French Battery Co., batteries	37 50	
Fay & Egan Co., J. A., knives	5 76	
Gross Hdw. Co., P., keys, springs, hardware	22 30	
Gilbertson & Anderson, stars, clock, repairs	14 50	
Gould, Wells & Blackburn, mdse.	80 12	
Gram, E., freight	4 62	
Gagan & Co., J. M., pump	4 00	

Gallagher Co., John, awnings, use of flags, covers	45 75	
Gimbel Bros., carpet	84 83	
Gifford, W. E., grader	100 00	
Gay, Lucy M., fees	10 00	
Greig, J., furniture	10 00	
Hoffman, Wm., oats	19 00	
Heller & Co., B., drugs	5 25	
Haak, Mrs. John, making towels	7 75	
Hiestand, W. D., expenses	9 43	
Hammersley, E. C., hay	11 70	
Harloff, P. F., mdse.	4 00	
Hull, R. D., cleaning	83 55	
l'Hommedieu, Jean, singing	10 00	
Huels, F., locks	5 00	
Haswell Furniture Co., furniture	51 66	
Harper, R. A., expenses	1 98	
Hayes, J. D., shoeing	11 80	
Hollister Drug Co., drugs, chemicals, sponges	56 54	
Holcomb Mfg. Co., J. I., mdse., brushes	61 80	
Halbach, J. P., nets, repairs, etc.	21 95	
Hoffman Mfg. Co., fittings	128 67	
Herfurth & Son, T., insurance	168 00	
Hoffman Feed Co., oats, shavings, feed	375 98	
Ill. Elect. Co., moulding	33 00	
Ill. Cent. Ry. Co., freight	1 29	
Jonas Bros., toweling, cover	13 35	
Johnson, A. A., instruction	15 00	
Jewell Nursery Co., plants	37 00	
Keeley, Neckerman & Kessenich, bunting	42 42	
Kimberly Clark Co., paper	1,571 06	
Klueter & Co., middlings, feed	222 08	
Kittleson, J. E., services	2 65	
Kemp, L., hay	22 00	
King, F. H., interest	400 00	
King & Walker Co., castings, etc.	52 90	
Kruel Co., W. C., desk, etc.	91 50	
Kroncke Bros., hardware	60 00	
Littig & Co., W. T., photogravures, etc.	654 00	
Lamb, C. F., Agt., premium	5 00	
Laird, W. P., plans, expenses	1,181 59	
Lyman, Dr. F. A., services	7 00	
Lyon & Healy, music	9 33	
Lynch, H., hay	14 66	
Lewis, S., handles	10 70	
Larson, L. O., fee	8 95	
Laaw Stables, livery	3 00	
May & Co., L. L., plants	384 75	
Moseley, J. E., stationery	234 85	
Minch, H. J., shavings	2 75	
McConnell, A. W., car fare	5 00	
Menges Pharmacy, drugs	4 30	
McGowan, H. B., tapes	13 15	
Madison Tent & Awning Co., awnings	12 00	
Madison Paint & Wall Paper Co., paints	32 18	
Mutchler, I., car fare	14 00	
Mandel Engraving Co., half-tones	92 84	
Madison Steam Laundry, laundry work	1 59	
Mautz Bros., paints, etc.	659 38	
Meyer, Frank M., horse shoeing	55 65	
Mayers, A. A., mdse.	51 16	
MacKenzie, F. W., University editor, salary	699 96	
Munro, D. C., expenses	316 33	
Madison Gas & Electric Co., gas and current	163 81	
Miller, Floyd, hay	19 50	
North Central Association of Colleges, fee	10 00	
New York Store, mdse.	50	
Neostyle Co., neostyle, paper	89 25	
Nickles, R. J., wire	6 35	
National Construction Cotton Co., napkins	8 00	
Nicodemus, R. C., premiums	45 00	
Northern Electric Co., apparatus ,etc.	7 50	
Owen, H. E., balance on bass viol	28 25	
Orr & Lockett Hardware Co., hardware	19 50	
Oppel's Fancy Grocery, oil, etc.	20 50	
Otis, Ed., hauling	50 00	
Owens, Wm., plumbing	2 40	
Olson, J. E., professor, salary	200 00	
Post Publishing Co., The, printing, express	2,364 22	
Proudfit, A. E., condemnation proceedings	20 00	
Paunack, E. F., stone	89 18	

Prescott Chem. Co., disinfectant	3 50	
Pickarts, L. J., bursar, postage, etc.	974 35	
Phillips, R. C., bobs	45 50	
Parsons Printing & Stationery Co., stationery, etc.	366 31	
Pickarts, L. J., bursar, cash advanced	736 74	
Parkinson-Marling Lumber Co., lumber	18 80	
Porter, G. L., charts	28 50	
Piper Bros., mdse.	68 45	
Paltz, John, cleaning carpet	3 40	
Phillips, J. D., engrossing	283 85	
Roe, F. W., expenses	12 20	
Rundle-Spence Mfg. Co., fittings	53 13	
Remington Typewriter Co., desk, etc.	19 55	
Reinsch, P. S., part expenses	100 00	
Revell & Co., A. H., desks	38 50	
State Journal Ptg. Co., printing, etc.	424 58	
Slaughter, M. S., expenses	35 63	
Standard Paper Co., paper	18 99	
Smith & Bros., L. C., typewriter	70 00	
Schwoegler & Bliss, plumbing	85	
Standard Oil Co., oil	5 76	
Stark Cabinet Mfg. Co., The, repairs	12 50	
Sumner & Morris, hardware	87 07	
State Treasurer, refund of interest	26 25	
Stenjem, N. P., condemnation proceedings	20 00	
Stephens, D., stone	41 12	
Smith Premier Typewriter Co., typewriter	70 00	
Sumner & Son, E., prescription	9 10	
Sandsten, E. P., professor, salary	900 00	
Streilinger Co., C. A., brush	1 44	
Skinner, E. B., expenses	24 85	
Sanborn & Blake, book	6 25	
Stevens, L. E., condemnation proceedings	45 00	
Sladky, P., assistant, salary	6 30	
Sellery, G. C., expenses	6 96	
Store Room, mdse.	175 07	
Student Farmer, The, subscription	100 00	
Smith, C. F., expenses	2 00	
Saffle, C. A., typewriter ribbons	16 00	
Thorburn & Co., J. M., plants, seeds	24 50	
Taylor, R. F., witness	5 00	
Tressler, A. W., expenses	278 82	
Taylor & Gleason, printing	20 00	
Tracy, Gibbs & Co., printing	250 45	
Underwood Typewriter Co., chair	5 95	
University Cooperative Co., stationery	1 25	
United States Express Co., express	70 53	
University pay roll, janitors	10,075 15	
Valvoline Oil Co., oil	13 43	
Vaughan's Seed Store, seed	25 70	
Van Hise, C. R., president, maintenance of house	500 00	
Van Dusen & Son, A., repairs	5 75	
Wehrmann, Chas., repairing	12 10	
Wisconsin Literary Magazine, magazines	125 00	
Western Union Telegraph Co., messages	5 05	
Wisconsin Wagon Co., wagon, pole, etc.	271 75	
Weber Costello Co., crayons	15 00	
Wolff, Kubly & Hirsig, hardware	18 35	
Wisconsin Telephone Co., messages	2,346 82	
Wiedenbeck, Dobelin & Co., hardware	11 07	
Western Bank Note Co., diplomas	1,175 00	
West, J. P., assistant	4 50	
Wisconsin Workshop for the Blind, baskets	8 04	
Western Electric Co., mdse.	59 55	
Wisconsin Alumni Magazine, advertising	150 00	
Yawkey-Crowley Lumber Co., lumber	146 85	
Total		$45,957 45

OBSERVATORY

American Express Co., express	$3 39	
Administration pay roll, clerks, etc.	468 49	
Burger, Peter, hardware	30	
Crane Co., pipe, etc.	1 70	
Conklin & Sons, coal, etc.	196 00	
Clark Engraving Co., cuts, etc.	1 79	
Comstock, G. C., professor, salary	3,000 00	
Castle & Doyle, cement	12 75	

C. & N. W. Ry. Co., freight	46	
Downey & Kruse Co., repairs	34 70	
Electrical Supply Co., mdse.	2 25	
Flint, A. S., astronomer, salary	2,000 00	
Frederickson, A. D. & J. V., lumber	9 21	
Grimm's Bindery, binding	9 00	
Gaertner & Co., Wm., lamps	2 40	
Gilbertson & Anderson, repairs, etc.	30 00	
Harris Co., S., fittings	80	
Harloff, P. F., mdse.	90	
Hollister Drug Co., drugs, etc.	50	
Karstens, C., upholstering	10 50	
Keeley, Neckerman & Kessenich Co., quilts, etc.	1 80	
Lorenz, E. H. J., mechanician	5 72	
Menges Pharmacy, drugs, etc.	2 40	
Madison Gas & Electric Co., gas, current and power	13 75	
Moseley, J. E., stationery	65	
Mayers, A. A., mdse.	48	
Mautz Bros., paints, etc.	9 80	
Parsons Printing & Stationery Co., printing, etc.	12 56	
Pickarts, L. J., bursar, postage	17 00	
State of Wisconsin, insurance	165 82	
Standard Paper Co., paper	50	
Sumner & Morris, hardware	23	
Store Room, mercandise	6 52	
Tracy, Gibbs & Co., printing	6 75	
University Cooperative Co., stationery	6 05	
University pay roll, janitors, etc	849 16	
United States Express Co., express	1 63	
Vaughan's Seed Store, hose, etc	9 50	
Western Union Telegraph Co., messages	1 23	
Wisconsin Telephone Co., messages	50	
Wolff, Kubly & Hirsig, hardware	9 70	
Yawkey-Crowley Lumber Co., lumber	21 55	
Total		$6,923 47

CHADBOURNE HALL

Alford Bros., laundry	$3 08	
Administration pay roll, clerks, etc	450 00	
Baumbach Reichel Co., ammonia	14 79	
C., M. & St. P. Ry. Co., freight	1 29	
C. & N. W. Ry. Co., freight	11 88	
Cooley, C. F., coal	1,778 55	
Crane Co., pipe, etc	6 49	
City of Madison, water	75 21	
Clow & Sons, J. B., pipe, etc	47 56	
Challoner Co., repairs	41 69	
Capital City Fuel Co., cement	6 75	
Castle & Doyle, cement, etc	90	
Doyon & Rayne Lumber Co., lumber	13 08	
Electrical Supply Co., merchandise	24 63	
Frederickson, A. D. & J. V., lumber	10 39	
Hollister Drug Co., drugs	52	
Harloff, P. F., merchandise	4 58	
Heat and Water, percentages	1,669 63	
Landon Iron & Wire Works, E. R., fire escapes	493 00	
Mautz Bros., paints, etc	238 93	
Meyer, Jessie M., mistress, salary	800 00	
Madison Gas & Electric Co., gas and current	2,265 46	
Madison Paint & Wall Paper Co., paints, etc	42 42	
Minneapolis Bedding Co., beds ,matresses, etc	172 24	
Madison Tent & Awning Co., awnings	12 50	
Northern Electrical Mfg. Co., motor, etc	38 50	
New York Store, merchandise	4 50	
Otis Elevator Co., points	4 16	
Pitman Dry Goods Co., rug	9 75	
Pickarts, L. J., bursar, postage	2 00	
Roeblings Sons Co., J. A., rope	19 31	
Sumner & Morris, hardware	30	
State of Wisconsin, insurance	331 62	
University pay roll, janitors, etc	2,577 60	
Western Union Telegraph Co., messages	65	
Western Electric Co., bells	3 12	
Wolff, Kubly & Hirsig, hardware	90	
Total		$11,1 0 93

GENERAL LIBRARY, 1907-08.

A. L. A. Pub. Co., cards	$1 08	
Amerika Pub. Co., book	4 00	
Administration pay roll, clerks, etc.	12 15	
American Ceramic Society, books	3 20	
Accountancy Pub. Co., subscription	2 00	
American Society for Test. Mat., book	4 00	
American Association for Labor Leg., dues, etc.	5 12	
American Microscopical Society, books	2 00	
American Pub. Health Assn., report	5 00	
American Pol. Sci. Assn., dues	3 00	
American Express Co., express	38 11	
Burke, L. C., library assistant, salary	1,091 63	
Bowen, Agnes, T., library assistant, salary	581 25	
Bradstreet Co., books	140 00	
Brockhaus, F. A., books	380 54	
Crane Co., pipe, etc.	20 28	
Capital City Paper Co., paper	3 00	
Cutting, S. W., books	4 23	
Coddington, Hester, head cataloguer, salary	1,301 63	
Clark Co., G. P., tires	2 14	
C., M. & St. P. Ry. Co., freight	73 30	
Classical Association of M. W. & S., dues	2 00	
Cary, C. P., dictionaries	15 00	
C. & N. W. Ry. Co., freight	166 09	
Danek, W. B., book	1 50	
Democrat Printing Co., printing	2 25	
Davidson, Flora N., library assistant, salary	595 00	
Dixie Book Shop, periodicals, reports	10 00	
Dowling, L. W., reports	3 85	
Dudley, W. H., assistant librarian, salary	1,600 00	
Engineering Magazine, index	1 00	
Electric Journal, book	3 55	
Freres-Berthaud, books	18 20	
Grimm's Book Bindery, binding	1,304 55	
Genthner, P., books	1 20	
Geological Society of America, bulletin	10 00	
Grove, Arlene, library assistant, salary	890 00	
Heffer & Sons, Wm., book	6 33	
Hogan, M. J., fees	3 25	
Hartranft, F. B., books	2 08	
Holway, E. W. D., book	2 00	
Higham & Son, C., book	1 97	
Haskell, Ida C., book	5 66	
Herfurth & Son, insurance	21 00	
Heat and water, percentages	2,623 68	
Illinois Central Ry. Co., freight	20 33	
Johns-Hopkins Press, periodical	1 50	
Kuhlman, J., periodicals	7 00	
Knudson, Agnes C., library assistant	405 00	
Loeser & Co., F., book	1 30	
Ladd Co., N. M., book	2 75	
Lechevalier, J., books	64 83	
Lockard, A. M., book	15 00	
Library Bureau, cards, etc.	70 20	
Longmans, Green & Co., books	62 00	
Lea & Febiger, book	18 00	
Library of Congress, cards	100 51	
Morrison, N. F., salary	1 80	
MacDonald, K. I., books	8 00	
Miner, Sarah H., library assistant, salary	701 25	
Menges Pharmacy, drugs, etc.	1 10	
Miner, Ruth, P., library assistant, salary	550 00	
Music Teachers' National Association, catalog	1 60	
Madison Gas & Electric Co., gas and current	1,371 85	
Munro, D. C., books	20 48	
MacMillan Co., bulletin	2 50	
Mautz Bros., paints, etc.	2 60	
McCulloch, Isabella J., library assistant, salary	641 25	
McClurg & Co., A. C., books	1,870 72	
New York Botanical Garden, books	3 00	
New England Botanical Club, subscription	1 00	
National German-American Teachers' Seminary, subscription	1 50	
Nature Study Review, periodicals	4 70	
National Educational Association, books	4 00	
Owen, Mrs. R. S., book	2 00	
Osborne, Julia S., library assistant, salary	525 00	

Psychological Review, book	4 00	
Psychological Clinic Press, subscription	1 50	
Parsons Printing & Stationery Co., printing and stationery	194 65	
Poor's Railroad Manual Co., book	10 00	
Publishers' Weekly, advertising	6 10	
Poet Lore Co., book	4 00	
Pyre, Amelia F., library assistant, salary	341 25	
Public Ownership Com., report	10 00	
Pickarts, L. J., bursar, postage, bills paid	70 24	
Rosenthal's Antiquariat, books	168 80	
Remington Typewriter Co., use of machines, etc	5 00	
Railway World, books	115 00	
Railway Club of Pittsburg, books	2 00	
Religious Educational Association, fee	3 00	
Reeve, W. G., book	9 00	
Sotheran & Co., H., books	19 54	
Sutton, A., books	14 22	
System Co., books	11 00	
Smithsonian Institution, books	64 40	
Skidmore, Stanley, library assistant, salary	401 25	
Store Room, mdse	52	
Shepard Book Co., book	4 25	
Sauvanand, P., photos	19 99	
Sumner & Morris, hardware	50	
Standard Paper Co., paper	1 50	
State Historical Society, excess cost over one-half	315 14	
Steve, H. J., papers, subscription	6 00	
Schaefer, Ellen, library assistant, salary	600 00	
Smith, W. M., librarian, salary, publication	2,603 75	
Sanford, Delia C., library assistant, salary	855 00	
Stechert & Co., G. E., books	15,319 33	
Taylor, T. J., book	4 75	
Taylor-Holden Co., books	3 15	
Teachers' College, books	3 50	
University Cooperative Co., stationery	3 70	
University of Chicago Press, advertising, books, etc	35 93	
University pay roll, janitors, etc	1,019 05	
University Press, The, subscription	3 00	
Usher, R. J., library assistant, salary	655 00	
University Press, Oxford, books	13 24	
United States Express Co., express	17 00	
Wyer, J. I., Jr., books	2 45	
Wilson Co., H. W., subscriptions	17 00	
Whitney, Helen G., library assistant, salary	137 50	
Wellepp, Leila M., library assistant, salary	166 88	
Welter, H., periodicals	7 02	
Wahr, Geo., book	3 00	
Wegelin, O., books	50 18	
Total	— —	$42,558 07

MILITARY DEPARTMENT

Administration pay roll, clerks	$80 00	
American Express Co., express	10 05	
Birkett, M. W., prize	50 00	
Burdick & Murray Co., merchandise	3 10	
Band pay roll, musicians	350 00	
C., M. & St. P. Ry. Co., freight	20 98	
Chief of Ordnance, stores	275 15	
Commissioned officers, Rock Island Arsenal, repairs	4 00	
Cunningham, J. W., oil, etc	1 00	
C. & N. W. Ry. Co., freight	63	
Esser Co., L., medals	27 00	
Frederickson, A. D. & J. V., lumber	14 98	
Gold Medal Comp. Furn. Co., litters	18 76	
Hopson, H. C., salary	90 00	
Hobbins, H. B., insurance	61 90	
Holton & Co., F., instruments, repairs	87 50	
Hollister Drug Co., drugs	60	
Heinz, A., prize	50 00	
Jewell Belting Co., cosmic	5 00	
Kroncke Bros., hardware	3 73	
Lyon & Healy, instruments	34 55	
Lilley & Co., M. C., medals, sword, repairing	99 20	
McCoy, Ralph, commutation of quarters	288 00	
Madison Saddlery Co., harness	75	
Mercein, C. S., prize	50 00	
Mautz Bros., paints	9 95	
Nicodemus, R. C., premiums	160 67	

Northwestern Lith. Co., engraving	52 90	
New St. Nicholas Restaurant, meals	5 00	
Owen, H. E., bills paid	13 05	
O'Connell, J. W., use of range	25 00	
Phillips, J. D., engrossing diplomas	12 90	
Park Hotel, meals	5 50	
Postal Telegraph Co., messages	1 25	
Pickarts, L. J., bursar, postage	14 00	
Parsons Printing & Stationery Co., printing	36 00	
Regimental Officers, refunds	220 00	
Sumner & Morris, hardware	50	
Standard Paper Co., paper	55	
Starke, F., oboe	50 50	
Tracy, Gibbs & Co., printing	6 75	
University pay roll, janitors	283 98	
United Express Co., express	3 35	
Western Union Telegraph Co., messages	1 36	
Wiedenbeck, Dobelin & Co., hardware	3 94	
West Point Post Exchange, sabres	70 27	
Wolff, Kubley & Hirsig, hardware	2 50	
Total		$[illegible]6 79

UNIVERSITY EXTENSION

Administration pay roll, clerks, etc.	$2,580 35	
Ayer & Son, N. W., periodical	5 00	
Averbeck, F. A., clock	1 00	
Audel & Co., Theo., manual	1 60	
Apter Typewriter Supply Co., paper, carbon	13 50	
American School of Correspondence, books	26 60	
American Express Co., express	13 18	
Boyer, E. A. salary	624 66	
Baker, A. R., stencils	20 69	
Cantwell Printing Co., printing, etc.	189 75	
Charities Pub. Com., subscription	1 80	
Cary, C. P., dictionary	7 50	
Craigo, R. T., salary	240 00	
C. & N. W. Ry. Co., freight	5 26	
C., M. & St. P. Ry. Co., freight	8 39	
Democrat Printing Co., printing	33 57	
Dearholt, Dr., express	5 98	
Dick Co., A. B., pointer	4 50	
Doyon & Rayne Lbr. Co., lumber	9 00	
Electrical Supply Co., merchandise	17 25	
Egelhoff, R. F., drawings	11 80	
Frederickson, A. D. & J. V., lumber	42 12	
Frost, W. D., expenses	18 76	
Flisch, Julia A., car fare	2 60	
Globe-Wernicke Co., desks	49 50	
Gibson, W. G., drafting	3 40	
Greig, John, chairs	19 50	
Haswell Furniture Co., furniture	407 51	
Harloff, P. F., merchandise	1 75	
Hunt, C. L., expenses	2 61	
Hammersmith Engraving Co., halftones	5 95	
Hutchins, F. A., salary	1,100 00	
Hammer, M. R., blue prints	81 76	
Hutchins, F. A., expenses	177 77	
Ives, F. W., prints	24 50	
International Textbook Co., photographs, pamphlets, etc.	44 83	
Illinois Central Ry. Co., freight	65	
Jackson, J. P., instruction	15 93	
Kroncke Bros., hardware	2 45	
Koch, H., boxes	13 25	
Keown, R. McA., drawings	27 00	
Lighty, W. H., expenses	2,052 11	
Legler, H. E., expenses	5 18	
Moseley, J. E., stationery	73 23	
McClurg & Co., A. C., books	85 85	
McCarthy, Charles, expenses	23 40	
MacKenzie, F. W., expenses	4 78	
Mautz Bros., paints	5 25	
Meyer News Service Co., clippings	7 50	
Nielson, E. C., slides	66 80	
Newton-Rotherick Mfg. Co., The, paper	12 50	
Owen, H. E., expenses	11 34	
Otto, Max, instruction	1 00	
Parsons Printing Co., printing	186 75	

Park & Saffle Co., supports	4 00	
Piper Bros., groceries	75	
Pickarts, L. J., bursar, bills paid	1,421 03	
Phillips, J. D., drawing, instruction, etc	48 30	
Roump, A. H., multigraphing	12 00	
Revell & Co., A. H., desks	56 00	
Reber, L. E., expenses	180 31	
Reber, Louis E., dean, salary	4,000 00	
Ravenel, M. P., expenses	9 99	
Remington Typewriter Co., use of machine, ribbon	32 30	
Richter, A. W., expenses	28 55	
Smith & Bros. Typewriter Co., L. C., machines	210 00	
Smith Premier Typewriter Co., ribbons, typewriter, etc.	80 00	
Standard Paper Co., paper	25 20	
Smith, Charles C., tags	5 46	
Sign Shop, The, signs	5 00	
Saffle, C. A., stationery	3 40	
Smith & Co., S., books	1 35	
Sumner, Helen L., salary	500 00	
Smith, K. G., expenses	56 28	
Store Room, merchandise	67 86	
State Journal Printing Co., printing	33 74	
Shaw-Walker Co., cards, etc	18 20	
Sewell-Clapp Mfg. Co., envelopes	94 00	
Smith, C. C., tags	7 39	
Stechert & Co., G. E., books	1 40	
Smith, K. G., salary	900 00	
Tracy, Gibbs & Co., printing	2,032 75	
Toellner, Wm., expenses	22 90	
Thompson & Norris Co., tubes	2 00	
University pay roll, janitors, etc	141 49	
University Co op. Co., stationery	7 75	
Underwood Typewriter Co., stencils	6 25	
Utzerath, Wm., models	10 00	
U. S. Express Co., express	21 20	
Van Hoesen Co., H. M., letterheads	139 50	
Wisconsin Telephone Co., messages, telephones	8 40	
Wilmore, J. J., expenses	53 40	
Wittl, A. A., printing	5 75	
Wilson Co., H. W., book	6 15	
Western Union Telegraph Co., messages	6 63	
Wright Directory Co., directory	6 00	
Waltzinger, C., dolls	2 10	
Total		$18,674 08

ARCHITECT'S OFFICE

Administration pay roll, clerks	$3,627 50	
American Express Co., express	2 20	
Burger, Peter, hardware	3 25	
Capital City Fuel Co., cement	3 37	
Castle & Doyle, cement	90	
C. & N. W. Ry. Co., freight	40	
C., M. & St. P. Ry. Co., freight	5 37	
Doyon & Rayne Lumber Co., lumber	11 49	
Dietzgen Co., E., blue print	75 00	
Moseley, J. E., stationery	2 00	
Nielson, E. C., slides	3 00	
Pickarts, L. J., bursar, postage	35 75	
Paper Mills Co., paper	4 65	
Parsons Printing & Stationery Co., stationery	70 89	
Postal Telegraph Co., telegrams	25	
Remington Typewriter Co., repairs, etc	11 70	
Store Room, merchandise	17 42	
Standard Paper Co., paper	3 15	
Sumner & Morris, hardware	1 51	
Soltmann, E. G., forms	1 43	
Tracy, Gibbs & Co., printing	1 75	
United States Blue Print Paper Co., paper	20 81	
University Cooperative Co., stationery	15 10	
United States Express Co., express	1 30	
University pay roll, janitors	43 78	
Western Union Telegraph Co., messages	25	
Wolff, Kubly & Hirsig, hardware	60	
Total		$3,964 82

FEES REFUNDED

Aldrich, L.	$4 00	
Alvarez, J. G.	32 60	
Arneson, A.	10 00	
Anderson, P. M.	13 60	
Anderson, G. L.	12 00	
Bonham, C.	5 00	
Bu Dahn, L. A.	2 00	
Bonesein, E. F.	4 60	
Belles, C.	20 00	
Bullard, E.	15 00	
Bockelmann, B. J.	15 00	
Bulfin, G. T.	15 00	
Buckett, Wm. C.	8 80	
Beatty, E. J.	20 00	
Barrows, R. C.	20 00	
Baker, J. F.	20 00	
Blankenberg, H. L.	8 00	
Brukowsky, A. H.	7 00	
Birchard, W. E.	9 00	
Brager, H. A.	5 00	
Buth, O. E.	3 20	
Bane, G. M.	5 00	
Bane, J. L.	5 00	
Barth, W. J.	6 00	
Bellack, K. O.	6 60	
Brown, G. H.	12 00	
Beitel, R. M.	20 00	
Curtis, R. E.	15 00	
Cox, G. H.	15 00	
Collins, A. L.	20 00	
Crocker, F.	12 00	
Canaran, J. P.	11 00	
Cottingham, E. Y.	15 00	
Cody, I. M.	8 00	
Colburn, G. B.	20 00	
Coleman, R. V.	10 00	
Christensen, H.	11 00	
Conlin, W. H.	16 00	
Doe, E. A.	15 00	
Dodge, P. C.	20 00	
Donovan, K.	10 00	
De Boos, F. A.	20 00	
Danson, W. L.	12 00	
Friederich, A. E.	7 20	
Ford, T. R.	3 00	
Faull, C. O.	8 80	
Fox, Dora R.	8 00	
Geyer, A. N.	20 00	
Gowin, E. B.	8 00	
Gilhard, C. G.	8 00	
Gottschalek, C. A.	5 20	
George, W. R.	32 60	
Garner, H. C.	9 60	
Hess, R. H.	21 00	
Hubbard, J. B.	6 00	
Heath, W. C.	29 60	
Huguley, E. D.	7 75	
Hackett, C. W.	20 00	
Horstkotts, F.	20 00	
Haskins, A. A.	15 00	
Hopson, A. J.	8 00	
Hopkins, Mary W.	20 00	
Hughes, M. J.	10 00	
Hanchett, D. L.	15 00	
James, Ruth V.	8 00	
James, G. H.	8 80	
Johnson, F. E.	20 00	
Jones, M. F.	10 00	
Kleinheinz, C.	2 00	
Kieckhefer, A.	12 80	
Krauskopf, F.	15 00	
Kelly, C.	6 00	
Kerr, W. H.	20 80	
Leaper, H. W.	12 80	
Leahy, E. T.	12 80	
Lewis, Margaret E.	10 00	
Longbotham, L. N.	8 80	

Lansing, A.	4 00	
Lynch, W. O.	25 00	
Leykon, J. W.	11 00	
Lehman, F.	10 00	
Larson, A.	10 00	
Lynch, Anna	8 00	
Lewis, E. M.	13 60	
Langdon, J. J.	4 40	
Lewis, L. B.	12 00	
Moore, L. E.	16 00	
Marshall, J. D.	9 60	
Murrish, Wm. N.	3 20	
McWilliams, R. M.	35 00	
Minsart, A.	8 80	
Merkin, A. E.	28 80	
Oakes, F. H.	20 00	
Olson, Mabel	25 00	
Pickarts, L. J., bursar	3 75	
Purdie, M. M.	32 00	
Phillips, Blanche B.	15 00	
Polzin, A. W.	25 00	
Pease, C. C.	20 00	
Popp, L. W.	20 00	
Polzin, B. A.	15 00	
Powell, W.	21 60	
Porter, L. W.	12 80	
Pfund, H.	4 00	
Robinson, W. A.	20 00	
Ramsay, O. P.	11 00	
Roderick, L. M.	1 00	
Ruzek, C. V.	15 00	
Riley, W. P.	8 80	
Roberts, Earl	5 60	
Rickerman, Leonora	12 00	
Rutherford, Mary	12 00	
Rex, J. L.	6 60	
Stroh, G. R.	20 80	
Stier, J. P.	12 00	
Staley, F. H.	15 00	
Smith, P. F.,	15 00	
Shatto, E.	15 00	
Smith, W. W.	10 00	
Scholz, A.	5 75	
Schultz, E. W.	4 60	
Slocomb, C. H.	4 60	
Shuff, C. B.	16 20	
Steinmetz, W. C.	11 00	
Scantleton, J. M.	11 00	
St. Peter, L. U.	15 00	
Shaff, J. O.	11 00	
Stickney, M. E.	10 00	
Shurts, C. L.	20 00	
Schwartz, A. A.	9 60	
Starr, F. M.	13 60	
Slocum, P. W.	15 00	
Stevens, K. I.	11 00	
Spray, D. G.	15 00	
Stoppenbach, C. R.	2 20	
Stevens, L. J.	11 00	
Stoll, C. A.	25 00	
Tottingham, W. E.	10 00	
Tomlinson, L. F.	12 00	
Thomas, Mary E.	10 00	
Tanner, H. F.	6 40	
Taylor, A. W.	15 00	
Theobald, J. E.	8 80	
Tracy, O. C.	2 00	
Timbers, M. T.	15 00	
Tyrrell, H. B.	28 80	
Van Horn, I. H.	20 00	
Wittwer, H. L.	7 20	
Woodard, Winifred M.	20 00	
Wadleigh, S. L.	12 00	
Wipperman, E. H.	8 00	
Wieland, O. E.	12 00	
Williams, F. E.	5 00	
Watke, R. T.	9 00	
Winteler, C.	7 20	
Zinke, W. H.	15 00	
Total		$1,093 85

UNIVERSITY GROUNDS, 1907-08.

Buell & Lucas, condemnation proceedings	$201 75	
Clerk of Circuit Court, Dane Co., Gratz condemnation	3,200 00	
Total		$3,401 75

PIANO ACCOUNT, 1907-08.

Gram, E., piano	$1,000 00	
Postal Telegraph Co., messages	1 04	
Smiley, B. E., tuning, repairs	191 50	
Total		$1,193 14

J. J. HILL RAILWAY LIBRARY FUND, 1907-08.

American Express Co., express	$6 12	
Connecticut State Range, book	1 24	
Clark Co., A. H., reports	6 92	
Dixie Book Shop, reports, manual, etc.	155 53	
Engelke, G., catalog	1 00	
Grimm's Bindery, binding	123 50	
Hart, J., reports	16 65	
Illinois Central Ry. Co., freight	50	
Ladd Book Co., N. M., book	3 86	
McClurg & Co,. A. C., books	21 24	
Pickarts, L. J., bursar, bills paid	2 38	
Southern Book Exchange, reports	40 50	
Seabrook, I. D., report, books	3 53	
Stechert & Co., G. E., books	811 17	
Taylor, T. J., periodicals, books	30 90	
United States Express Co., express	1 42	
Usher, R. J., collecting	300 00	
Total		$1,526 46

WOMAN'S BUILDING, 1907-08.

Administration pay roll	$1,421 80	
American Contractor, advertising	43 20	
American Express Co., express	3 90	
C. M. & St. P. Ry. Co., freight	6 48	
Capital City Paper Co., paper, etc.	9 72	
Crane Co., pipe, etc.	49	
Chromide Co., The, advertising	16 00	
C. & N. W. Ry. Co., freight	65	
Democrat Printing Co., advertising	20 60	
Frederickson, A. D. & J. V., lumber	59 00	
Gazette Printing Co., advertising	8 40	
Germania Herold Assn., advertising	16 13	
Improvement Bulletin, advertising	32 20	
Mautz, Bros., paints, etc.	6 33	
Moseley, Jas. E., stationery	2 00	
Nielson, E. C., slides, etc.	45	
Owen, R. S., maps	12 00	
Postal Telegraph Co., messages	1 25	
Parsons Ptg. & Sta. Co., printing and stationery	33 85	
Pickarts, L. J., bursar, postage, etc.	19 50	
Peabody, A., expenses	194 80	
Sumner & Morris, hardware	1 58	
Sentinel Co., The, advertising	49 90	
University Cooperative Co., stationery	31 50	
United States Blue Print Paper Co., drawing material, blue print paper	48 95	
United States Express Co., express	6 81	
University pay roll, janitors, etc.	45 37	
Western Union Telegraph Co., messages	4 35	
Wolff, Kubly & Hirsig, hardware	5 00	
Western Builder Pub. Co., advertising	5 30	
Yawkey-Crowley Lumber Co., lumber	5 98	
Total		$2,112 39

TUNNELS, 1907-08.

Administration pay roll, clerks, etc.	$170 00	
Frederickson, A. D. & J. V., lumber	2 64	
Owen, R. S., survey	15 00	
Parsons Ptg. & Sta. Co., printing, etc.	4 45	
Smith, J. M., expenses	15 67	
Store Room, mdse.	21 85	
United States Express Co., express	75	
University pay roll, janitors, etc.	1 50	
Total		$231 87

NEW CENTRAL PLANT, 1907-08.

Administration pay roll, clerks, etc.	$679 40	
Andrae & Sons Co., lamps, etc.	2 51	
American Express Co., express	1 40	
American Contractor Co., advertising	11 40	
Blied & Schneider, hardware	1 65	
Bull, Storm, expenses	46 29	
C. & N. W. Ry. Co., freight	95 42	
Clow & Son, J. B., pipe, fittings, etc.	15 72	
Castle & Doyle, cement, lime, etc.	3,906 00	
C. M. & St. P. Ry. Co., freight	305 20	
Democrat Printing Co., printing and advertising	8 40	
Evening Wisconsin, advertising	47 25	
Expended Metal Co., steel	991 35	
McCarthy, T. C., contract	16,000 00	
Parsons Ptg. & Sta. Co., printing and stationery	32 10	
Pickarts, L. J., bursar, postage	2 00	
Parkinson-Marling Co., lumber	72 93	
Pieh, J. F., sand	855 00	
Quinn, Nicholas, excavating	16 75	
Store Room, mdse.	4 41	
Sumner & Morris, hardware	1 00	
State Journal Ptg. Co., printing and advertising	15 25	
Stephens, David, crushed stone	2,048 14	
United States Express Co., express	3 75	
University pay roll, janitors, etc.	292 27	
University Cooperative Co., stationery	41 79	
United States Blue Print Paper Co., blue prints	11 10	
United States Cast Iron Pipe Co., pipe	381 80	
Universal Portland Cement Co., cement	1,835 05	
Wolff, Kubly, & Hirsig, hardware	9 00	
Wisconsin Telephone Co., service	1 00	
Woden-Allen Co., contract	17,909 00	
Wood & Co., R. D., hydrant, valve, etc.	68 40	
Western Union Telegraph Co., messages	1 01	
Wiedenbeck, Dobelin & Co., hardware	936 47	
Total		$46,650 21

ADDITION ADMINISTRATION BUILDING, 1907-08.

C. & N. W. Ry. Co., freight	$0 25	
C. M. & St. P. Ry. Co., freight	3 02	
Findorff, J. H., labor and material	135 00	
Hoffman Mfg. Co., B., pipe	5 52	
Illinois Cent. Ry. Co., freight	34	
Kroncke Bros., hardware	135 42	
McCarthy, T. C., contract	9,240 00	
Pickarts, L. J., bursar, bills paid	75	
Rundle-Spence Mfg. Co., fittings, zinc	87 62	
Store Room, mdse.	1 01	
Sign Shop, The, lettering	16 75	
University pay roll, janitors, etc.	227 88	
Wolff, Kubly & Hirsig, hardware	47 30	
Total		$9,900 86

STORE ROOM, 1907-08.

American Express Co., express	$0 75	
Boner Co., E. A., enamel	319 00	
C. M. & St. P. Ry. Co., freight	134 30	
Capital City Paper Co., paper, twine, etc.	68 15	
C. & N. W. Ry. Co., freight	10 89	

Dietzgen Co., E., tracing cloth, ink	146 81	
Gould, Wells & Blackburn Co., mdse.	44 25	
Hess, A. L., tools	38 50	
Harloff, P. F., electrical mdse.	80	
Illinois Central Ry. Co., freight	1 05	
Kroncke Bros., hardware	1 05	
Keuffel & Esser Co., pencils, tracing cloth	102 76	
Library Bureau, pens, cards, etc.	4 50	
Moseley, J. E., stationery	8 45	
McClurg & Co., A. C., books	7 21	
Menges Pharmacy, drugs, etc.	50	
Morrison, Plummer & Co., alcohol	19 19	
Mautz Bros., paints, etc.	88	
Pickarts, L. J., bursar, bills paid	80	
Parsons Ptg. & Sta. Co., stationery	105 45	
Prescott Chemical Co., disinfectant	7 00	
Piper Bros., groceries	21 69	
Remington Typewriter Co., paper, etc.	21 60	
Smith & Co., Shea, impression books	13 80	
Standard Oil Co., gasoline, oil, etc.	48 40	
Thompson & Norris Co., tubes	3 00	
Tracy, Gibbs & Co., printing, etc.	11 75	
United States Express Co., express	3 16	
United States Blue Print Paper Co., paper	3 36	
Universal Portland Cement Co., cement	533 40	
Wolff, Kubly & Hirsig, hardware	20	
Whiting Paper Co., paper	1 80	
World's Scrapbook Co., scrap books	12 00	1,700 89

Credit for supplies furnished various departments and charged as follows:

Agr'l College & Exp. Station	22 06	
College Letters & Science	33 86	
College Engineering	25 91	
Administration	45 55	
Laboratory Supplies	16 46	
College of Law	5 80	
Physical Culture, men	1 34	
Physical Culture, women	1 00	
General Account	175 07	
Observatory	6 52	
General Library	52	
Addition Administration Bldg.	1 01	
University Extension	67 86	
Architect's Office	17 42	
New Central Plant	4 41	
Tunnels	21 86	
Animal Husbandry Bldg.	2 00	449 25
Total		$1,251 64

AGRICULTURAL ENGINEERING BUILDING, 1907-08.

American Express Co., express	$0 75	
Albers, Wm., sand	12 75	
Bischoff, H. B., sand	5 04	
C. M. & St. P. Ry. Co., freight	77	
Crane Co., pipe, etc.	38 73	
Doescher, J., wiring	8 25	
Kiefer-Haessler Hdw. Co., hardware	70 00	
Mautz Bros., paints, etc.	9 43	
McCarthy, T. C., construction	8,965 00	
Pieh, J. F., sand	43 50	
Standard Paper Co., paper	60	
Sumner & Son, E., drugs, etc.	10	
Sumner & Morris, hardware	3 00	
University pay roll, janitors, etc	17 70	
United States Express Co., express	50	
Western Electrical Co., mdse.	8 50	
Total		$9,184 42

AGRONOMY BUILDING, 1907-08.

Albers, Wm., sand	$12 75	
American Express Co., express	80	
Bischoff, H. B., sand	5 04	
Crane Co., pipe, etc.	36 10	
Doescher, J., wiring	8 25	
Gross Hardware Co., P., hardware	75 00	
Mautz Bros., paints, etc.	9 42	
McCarthy, T. C., construction	5,600 00	
Madison Gas & Electric Co., connection	10 90	
Pieh, J. F., sand	43 50	
Sumner & Morris, hardware	1 50	
Standard Paper Co., paper	60	
Sumner & Son, E., drugs, etc.	10	
University pay roll, janitors, etc.	36 36	
Western Elect. Co., mdse.	8 50	
Total		$5,848 82

AGRICULTURAL ENGINEERING BUILDING EQUIPMENT, 1907-08.

American Express Co., express	$0 75	
American Seating Co., chairs	966 83	
Burger, Peter, hardware	4 30	
Bausch & Lomb Opt. Co., chemicals	99 35	
C. M. & St. P. Ry. Co., freight	30 97	
Castle & Doyle, cement, etc.	36 94	
Crane Co., pipe, etc.	51 00	
Chapman Co., T. A., carpet	292 60	
C. & N. W. Ry. Co., freight	6 99	
Electrical Supply Co., mdse.	430 26	
Fairbanks, Morse & Co., apparatus, tools, etc.	127 86	
Findorff, J. H., lumber, etc.	70 61	
Frederickson, A. D. & J. V., lumber	86 19	
Johns-Manville Co., H. W., covering	38 15	
Kroncke Bros., hardware	11 80	
Keystone Wire Matt. Co., mat	10 50	
Kiefer-Haessler Hardware Co., hinges	3 56	
Kieckhefer Elevator Co., A., elevator	560 37	
Madison Gas & Electric Co., gas and current	24 00	
Mautz Bros., shades, paints, etc	194 75	
Northern Electric Mfg. Co., motor, etc.	100 00	
Narragansett Machine Co., lockers	99 36	
Olson, B., chairs	12 55	
Polacheck & Bro. Co., C. fixtures	330 00	
Roddis Lumber & Veneer Co., lumber	5 88	
Sumner & Morris, hardware	1 75	
Stephens, D., stone	27 14	
University pay roll, janitors, etc.	785 25	
Western Electric Co., mdse.	24 45	
Wisconsin Telephone Co., service	80	
Western Union Telegraph Co., messages	68	
Yawkey-Crowley Lbr. Co., lumber	114 93	
Total		$4,540 57

AGRONOMY BUILDING EQUIPMENT, 1907-08.

Administration pay roll, clerks, etc.	$43 33	
American Express Co., express	40	
American Seating Co., chairs, etc.	435 00	
Barbee Wire & Iron Works, wire cloth, etc.	9 75	
C. & N. W. Ry. Co., freight	86 16	
C. M. & St. P. Ry. Co., freight	22 11	
Castle & Doyle, lime, etc.	5 79	
Crane Co., pipe, etc.	51 39	
Doyon & Rayne Lbr. Co., lumber	9 68	
Electrical Supply Co., mdse.	188 67	
Espenhain Dry Goods Co., carpet	281 90	
Frederickson, A. D. & J. V., lumber	161 20	
Findorff, J. H., lumber, etc.	40 60	
Greig, J., furniture	398 75	
Illinois Electric Co., motors, mdse. etc.	50 85	
Johns-Manville Co., H. W., covering	38 15	
King & Walker Co., castings	3 75	
Kroncke Bros., hardware	69 99	

Madison Gas & Electric Co., gas, current, etc.	25 00	
Mautz Bros., paints, etc.	97 35	
Owens, Wm., plumbing, etc.	125 00	
Olson, B., chair	6 27	
Roddis Lbr. & Veneer Co., lumber	8 63	
Sumner & Morris, hardware	2 60	
United States Express Co., express	70	
University pay roll, janitors, etc.	503 24	
Williamson & Co., R., fixtures	302 76	
Wolff, Kubly & Hirsig, hardware	9 45	
Western Electric Co., mdse.	24 45	
Yawkey-Crowley Lumber Co., lumber	58 18	
Total		$3,006 10

TROSTEL PRIZE FUND, 1907–08.

Bunde & Upmeyer Co., medals	$150 00	
Robinson, E. E., prize	100 00	
Total		$250 00

NORTH WING EQUIPMENT, 1907–08.

Andrews Co., A. H., balance contract	$115 25	
C. M. & St. P. Ry. Co., freight	3 15	
Packard Machinery Co., machinery, etc.	228 20	
Sumner & Morris, hardware	5 75	
University pay roll, janitors, etc.	68	
Total		$353 03

WERGELAND SCHOLARSHIP, 1907–08.

Holman, E. S.		$200 00

ALLIS SCHOLARSHIP, 1907–08.

Whyte, J., aid		$150 00

GUND SCHOLARSHIP, 1907–08.

Decker, P. H., aid		$25 00

KLETZSCH FELLOWSHIP FUND, 1907–08.

United States Express Co., express		$3 71

ANIMAL HUSBANDRY BUILDING, 1907–08.

American Express Co., express	$3 55	
Administration pay roll, clerks, etc.	567 90	
C. M. & St. P. Ry. Co., freight	20	
Keuffel & Esser Co., cloth	12 78	
Lawrence Co., G. R., photographs	2 00	
Parsons Ptg. & Sta. Co., printing, etc.	9 55	
Store Room, mdse.	2 00	
United States Express Co., express	40	
United States Blue Print Paper Co., paper	10 33	
University Cooperative Co., stationery	90	
Western Union Telegraph Co., messages	68	
Total		$610 29

EQUIPMENT ADMINISTRATION BUILDING, 1907-08.		
Andrae & Sons Co., J., mdse., lamps, etc.	$40 92	....
C. & N. W. Ry. Co., freight	7 74	....
Electrical Supply Co., buzzers, mdse.	21 34	....
Field & Co., M., carpet, etc.	200 06	....
Fredericksson, A. D. & J. V., lumber	65 41	....
Findorff, J. H., labor, etc.	48 00	....
Greig, J., furniture	56 50	....
Haswell Furniture Co., furniture	53 80	....
Harloff, P. F., mdse.	2 40	....
King & Walker Co., weights, oven, etc.	9 11	....
Kroncke Bros., hardware	08	....
Kruel Co., W. C., desk	41 50	....
Mautz Bros., paints, etc.	16 77	....
Nickles, R. J., wire, etc.	2 52	....
Sumner & Morris, hardware	5 90	....
Tyrrell, Joseph, table	15 50	....
University pay roll	8 60	....
Total		$ 91 .5

APPENDIX B

Details of Pay Rolls

DETAILS OF UNIVERSITY PAY ROLLS, 1906–07

ADMINISTRATION PAY ROLL

1906-07.

Austin, Eric W., student assistant, salary	$83 00	
Alford, Harry C., draughtsman, salary	532 50	
Briggs, Sophie M., librarian, salary	791 59	
Bullock, Wm. L., student assistant, salary	50 00	
Burdick, L. W., conducting examination	3 65	
Blankenagle, E. C., clerical work	69 20	
Burroughs, Rose, office work	5 58	
Busselman, Wm., assistant auditor, salary	192 31	
Curtin, James H., drafting	25 40	
Conger, J. L., student assistant	4 75	
Collins, George T., clerk	381 47	
Dohmen, Frances, stenographic work	33 63	
Drew, H. W., record work	1 60	
Dunton, Edith F., stenographic work	750 00	
Dietz, Eugene, services	6 00	
Evans, Magdalen, stenographer, salary	720 00	
Fellows, R. N., messenger	9 33	
Flish, Julia A., clerk and stenographer, salary	400 00	
Farley, Edward, blue prints	48 25	
Gayton, O. F., drafting	97 00	
Gallistel, A. F., drafting	227 50	
Glen, Mary A., clerk and stenographer	720 00	
Gormley, John H., blue prints, etc	395 50	
Goldschmidt, Wm. J., clerical work	182 91	
Gossling, Arthur, drafting	11 25	
Gallagher, Cora, clerical work	45 00	
Hiestand, W. D., registrar, salary	2,271 59	
Hayner, Grace H., clerk and stenographer	535 80	
Hart, Anna, bill and index clerk	683 33	
Herfurth, Ida, executive clerk	1,099 92	
Hartley, C. J., student assistant	6 00	
Hopson, H. C., clerk	15 00	
Hitchcock, Raymond, clerical work	63 25	
Hatch, Winifred, clerk and stenographer	450 00	
Heuer, Ena, record clerk	235 00	
Ives, Fred W., student assistant	46 00	
John, H. W., student assistant	4 35	
Kelly, Minnie, clerk and stenographer	20 00	
Kading, August, student assistant	50 00	
Leute, Helena, stenographer	243 00	
Lorigan, Daisy E., clerical work	26 66	
Lynch, Margaret, clerk and stenographer	2 80	
Lawrence, Edward J., messenger	216 00	
Lighty, Mary Y., typewriting	3 50	
Mills, Sadie, clerk and stenographer	18 72	
McWethy, H. E., tracing	2 40	
McConnell, A. W., superintendent of buildings	900 00	
McCaffrey, M. E., bookkeeper	1,237 30	
Merrick, Geo. B., accountant	1,091 59	
Merz, Aline, clerk and stenographer	500 00	
Moe, M. W., clerical work	50 10	
Martin, Georgia M., clerical work	105 00	
Nelson, E. B., student assistant	1 50	
Nelson, Karl O., student assistant	5 00	
Owen, Ray, student assistant	25 00	
Olson, Olga, clerk and stenographer	20 97	
Post, Maybelle M., clerk and stenographer	300 00	
Pickarts, L. J., bursar, salary	1,475 00	
Peabody, Arthur, architect, salary	3,000 00	
Parsons, Claire, clerk and stenographer	600 00	
Quackenbush, C. J., running lantern	2 40	

Riley, E. F., secretary, salary	3,250 00	
Randolph, Mabel, clerk and stenographer	900 00	
Randolph, William, assistant auditor	565 80	
Roy, R. M., clerk and stenographer	8 00	
Rinder, Mathilda L., auditing clerk	344 36	
Richards, M., running lantern	26 55	
Sullivan, Helen, clerk and stenographer	197 83	
Sanford, Fannie G., clerk and stenographer	720 00	
Schwede, Louise A., clerk and stenographer	104 08	
Smith, Maud E., student assistant	46 20	
Snyder, Mathilda L., record work	337 32	
Smith, O. R., office work	3 00	
Schnell, Lottie I., stenographer	701 50	
St. Sure, Violet, student assistant	6 80	
Smith, Glen E., student assistant	10 70	
Schmelzer, Henry, messenger	171 00	
Spencer, Katherine, stenographer	900 00	
Smith, J. M., drafting	260 93	
Turneaure, Florence, clerk and stenographer	595 00	
Thiele, O. V., student assistant	6 40	
Thompson, Grace, student assistant	64 85	
Timberlake, Violet S., record clerk	710 00	
Veerhusen, Letta, clerk and stenographer	17 85	
Van Auken, Clarice, clerical work	4 60	
Walker, Alice M., clerical work	16 30	
Wulfing, Alice, clerk and stenographer	333 33	
Wilkinson, Julia A., president's secretary	900 00	
Welsh, Iva A., librarian	660 00	
West, Bertha, clerk and stenographer	19 44	
Webster, Mrs. L. B., typewriting	11 89	
Woodruff, W., clerical work	20 80	
Wadsworth, M. Harriet, stenographic work	9 94	
Wilcox, Jessie E., clerk	280 74	
Webb, Alice L., press bulletin clerk	550 00	
Zabel, W. P., clerical work	6 25	
Total		$33,973 00

UNIVERSITY PAY ROLL

1906-07.

Anderson, B. S., machinist	$10 00	
Abbott, E. P., machinist	4 75	
Angus, D. J., electrician	172 00	
Arzberger, E. G., student janitor	40 00	
Albers, Wm., team work	701 53	
Appuhn, Wm., janitor	327 00	
Anderson, Tonnes, carpenter	308 84	
Anderson, George, laborer	392 20	
Adams, B. F., statistical work	14 40	
Anderson, P. M., electrician	452 40	
Armstrong, Wm., laborer	4 00	
Burke, J. H., laborer	87 40	
Bealey, L., laborer	21 00	
Burke, Maggie, charwoman	13 75	
Billig, Mrs. M., charwoman	30 75	
Burke, Minnie, charwoman	13 75	
Bishop, C. C., media making	33 00	
Beyler, Annie, charwoman	19 00	
Biehle, L. P., laborer	5 80	
Blum, H., catalog work	60 00	
Brigham, F., carpenter	42 81	
Burke, John, laborer	47 80	
Blayzo, John, laborer	3 22	
Brown, Cora, janitor work	17 40	
Burgess, L. G., machinist	7 50	
Bush, A. O., team work	76 00	
Berssenbrugge, B., electrician, lettering, etc	61 50	
Bolstead, Matilda, making stencils	1 10	
Burmeister, E., laborer	8 00	
Butler, Geo. M., janitor, tool room boy	146 44	
Batty, Charles, elevator man, laborer	523 35	
Budd, F. C., night watch	411 62	
Barnard, Chas. locker attendant	183 30	
Blankenagel, E. C., student assistant	1 80	
Bauhs, John, drayman	635 00	
Blake, Mrs. H., charwoman	251 50	

Boltz, John, janitor, salary	600 00	
Babcock, J. C., janitor, salary	600 00	
Braun, F. C., machinist	133 38	
Butler, J., laborer	385 80	
Blankenagel, J. C., student assistant	2 00	
Calkins, Frank, addressing	1 00	
Croft, Henry, carpenter	317 10	
Caffrey, M., charwoman	18 12	
Cutler, Cora, charwoman	16 00	
Cooper, Inez, charwoman	21 15	
Curtin, Jas., laborer	69 40	
Crissy, M. H., stenographer	32 80	
Cary, Pat, team work	62 75	
Craigo, John, laborer	1 61	
Croft, Harry, carpenter	187 80	
Cramton, B. L., typewriting	13 30	
Comer, R. O., machinist	13 80	
Coleman, Frank, steam fitter	400 25	
Crary, W. C., janitor	344 24	
Cass, Louis, night watch	50 00	
Craven, Kate, watchman, night watch	324 73	
Corcoran, C., page	66 00	
Conohan, J. E., janitor, salary	600 00	
Clifcorn, Henry, fireman, salary	660 00	
Casserly, Frank, laborer, salary	600 00	
Coyne, C. O., carpenter, salary	693 40	
Check, Frank, steam fitter	707 03	
Cline, Wm., laborer	348 00	
Doyle, J., team work	25 00	
Dean, A. T., laborer, machinist	13 20	
Dressler, Ben, machinist	367 43	
Daniels, Minnie, charwoman	29 87	
Dalzin, J., painter	25 80	
Dunton, Edith F., stenographer	150 00	
Davy, Mary, charwoman	17 37	
Diebold, Charles, laborer	21 80	
Dorsey, Thos., laborer	44 40	
Dresen, J., janitor	499 60	
Doescher, J., janitor	600 00	
Donlin, J. D., janitor	555 00	
Davis, B. F., media making	112 00	
Dohr, Hugo, carpenter	734 38	
Diebold, Wm., teamster, laborer	615 07	
Eastman, Geo., carpenter	169 80	
Egelhoff, R., drafting	2 40	
Ellis, Thos., chief engineer	900 00	
Fuss, Mary, charwoman	63	
Finnigan, L., laborer	12 40	
Fontana, L., laborer	20 93	
Farley, Edw., mason, team work	219 47	
Forbes, E. W., tool room boy	14 63	
Flint, Helen, clerk	5 00	
Fuss, Kate, charwoman	14 13	
Fuss, Chas., laborer	457 38	
Fliegge, Emily, nurse, salary	400 00	
Fitzpatrick, Frances, bell maid	16 00	
Faber, M. E., machinist	23 18	
Foye, A. E., engineer	271 76	
Godding, W. H., mason	558 20	
Gilbert, E. M., student janitor	18 00	
Gross, G. L., clerk	13 00	
Gilmore, Harvey, laborer	174 00	
Groenenthal, Kate, charwoman	27 00	
Grinde, J. W., laborer	39 00	
Groogin, F. W., addressing	2 80	
Goecks, Martha J., bell maid	14 00	
Grunert, Minnie, charwoman	19 00	
Grinde, J. L., helper, painter, etc	178 20	
Grasser, Mary, janitor	300 00	
Grade, Ernest, page at library	34 00	
Gill, H. Laura, student assistant	77 68	
Gyles, S., carpenter	565 15	
Hammersley, W. C., laborer	141 40	
Hughes, J. J., carpenter	123 75	
Haak, Elizabeth, charwoman	28 87	
Horstman, Fred, machinist	761 50	
Hoffman, O. P., machinist	22 95	
Higson, C. R., machinist	2 60	

Hawthorne, J. C., laborer	1 61	....
Hinze, F. H., laborer	118 40	....
Huels, F. W., drafting	11 60	....
Hatch, S. R., clerk	17 00	....
Hennessey, Charles, laborer	11 60	....
Hoyt, R. M., typewriting, etc	32 12	....
Hillis, Mrs. E., charwoman	12 65	....
Hatch, Winifred, clerk and stenographer	27 41	....
Hopson, H. C., clerk	60 00	....
Horton, G. W., elevator man, janitor	309 81	....
Huebner, Wm., plumber	225 00	....
Haak, Augusta, charwoman	59 60	....
Hetzel, H. C., student assistant	114 16	....
Hammersley, Wm., teamster	600 00	....
Harrison, Jas., fireman	665 00	....
Herrlein, V., laborer	635 00	....
Hallec, F. E., machinist	99 00	....
Haak, John, laborer	600 00	....
Herrlein, Jos., laborer	342 48	....
Helm, C., steam fitter	618 75	....
Hibbard, C. A., work in museum	38 60	....
Hinsey, Chas. D., laborer	165 40	....
Ives, F. W., drafting	30 60	....
Jones, O. L., media making, janitor work	40 55	....
Johnson, A. A., cleaning artillery	5 20	....
Janes, M. A., carpenter, mason	633 33	....
Jones, S. K., machinist	190 12	....
Kanouse, I. W., elevator	52 50	....
Kennedy, F. M., drafting	19 50	....
Kelly, J. A., plumber	6 34	....
Keyes, Wm., team work	42 22	....
Krupp, Mrs. C., charwoman	56 87	....
Kanouse, I. W., elevator	52 50	....
Kruse, Wm., elevator man	60 00	....
Koerber, Alvina, charwoman	18 62	....
Kelley, Minnie, stenographer	10 00	....
Kraft, A. N., mechanician	101 25	....
Kelzenberg, John, laborer, machinist	103 60	....
Knapp, Ida, charwoman	207 35	....
Kane, C. C., janitor	540 00	....
Knudson, Agnes C., student assistant	104 45	....
Koenig, H. H., machinist	81 30	....
Lemberger, Mary, charwoman	31 00	....
Lavin, F., laborer	16 60	....
Langley, N., painter	485 04	....
Lamphere, Wm., fireman	404 51	....
Lee, A., steam fitter	38 60	....
Lorch, G., machinist	98 30	....
Lueckenbach, E. J., janitor	35 35	....
Lynch, Jas., janitor	122 60	....
Link, Lizzie, charwoman	6 25	....
Lobre, H., page	15 60	....
Lang, C. H., laborer	72 60	....
Lynaugh, Ellen, charwoman	25 00	....
Lockwood, Mrs. R., charwoman	1 25	....
LaBella, W., laborer	41 65	....
Lemburger, George., laborer	57 00	....
Lorenz, Albert, laborer	34 93	....
Larson, G., laborer	293 83	....
Labella, A., laborer	218 45	....
Loomer, C. J., drafting	2 05	....
Locher, W. S., copying	2 25	....
Lynaugh, P., janitor	600 00	....
Lund, J. E., engineer	421 75	....
Lyford, Walter, electrician	670 68	....
Marsh, Chas., page	4 00	....
Marino, Jas., laborer	7 80	....
McDougal, E. L., addressing	16 25	....
Marshall, A. H., drafting	80 00	....
Marx, W. F., machinist	50 00	....
Muskey, Minnie, charwoman	19 00	....
Miller, Theresa, charwoman	38 00	....
Marx, J. E., tool room boy	32 07	....
Merz, Aline A., library work, stenographer	55 00	....
Moehlmann, Sophia, charwoman	14 75	....
Mahoney, Elizabeth, charwoman	37 50	....
McIntosh, Wm., steam fitter	310 60	....
Miles, Edw. L., steam fitter	632 31	....

Moll, Frank, carpenter	746 04	
Mitchell, A. G., steam fitter	588 08	
Morschhauser, E., janitor, supply clerk	600 00	
Mutchler, I., chief carpenter	1,083 33	
Morse, Willis, janitor	600 00	
Meier, Wm., janitor	180 00	
Millerin, B. L., machinist, janitor	32 88	
Maloney, E. D., laborer	19 80	
Malec, C., team work	83 17	
Moss, L. M., clerk, stenographic work	18 02	
Murphy, John, fireman	179 52	
Morgan, Geo., laborer	157 54	
Nebel, Carl, machinist	511 45	
Nicholson, P. H., student assistant	29 07	
Nicol, Donald, machinist	217 80	
Nolan, M., watchman, janitor	540 00	
Nalon, Kate, charwoman	267 37	
Nelson, K. O., clerk	71 25	
Noon, Etta, bell maid	165 33	
Olson, Olga, stenographer	6 70	
Olson, M. J., carpenter, painter	582 20	
Powell, M. A., stenographic work	8 00	
Peck, Molly, charwoman	28 87	
Peck, Mrs. Annie, charwoman	18 75	
Post, L. J., laborer	5 20	
Palfrey, J. R., cleaning shops	6 60	
Peterson, Annie, charwoman	29 49	
Premo, Jos., laborer	7 20	
Post, H. J., team work	49 50	
Patterson, M., locker attendant	5 32	
Post, Wm., janitor	630 00	
Post, L. M., machinist	949 34	
Post, W. G., laborer	40 00	
Quan, J. J., janitor	255 77	
Rapp, F. H., carpenter	528 30	
Rademaker, Oscar, moving furniture	7 70	
Ryall, B. R., media making	2 60	
Rowley, F. B., janitor	120 00	
Roump, Alma B., stenographer	9 00	
Ryan, Mary, charwoman	8 75	
Roberts, Lida, charwoman	16 00	
Roy, R. M., laborer	123 90	
Rahn, B, machinist	1 50	
Redel, Robert, steam fitter	438 40	
Russell, Jesse, engineer	780 00	
Rasmussen, G., painter	741 90	
Rommelfanger, M., janitor, carpenter	610 18	
Rosner, R., machinist	72 00	
Rider, J. H., valve inspector	335 00	
Reese, Lucy, chambermaid, charwoman	278 32	
Richards, M., lantern work, student assistant	24 75	
Smith, G. E., drafting	23 70	
Sale, Ole, carpenter	351 30	
Schlosser, Ormel, typewriting	1 20	
Stanley, M. R., carpenter	152 03	
Stevens, L. D., engineer	410 95	
Sullivan, J. A., moving furniture	2 10	
Swartz, D. W., locker attendant	111 00	
Scheibel, Elizabeth, charwoman	30 25	
Schumm, Mary, charwoman	12 75	
Scott, G. J., carpenter	135 98	
Sands, W., team work	62 23	
Scherer, L., laborer	22 68	
Smillie, R. K., media making	25 00	
Shay, R. R., machinist	30 60	
Simon, F. W., carpenter	183 90	
Severin, H. H. P., janitor	71 00	
Shaw, H. F., addressing	6 00	
Skidmore, S., page	72 00	
Seary, Sarah, charwoman	22 37	
Steenbock, H., laborer	468 20	
Scheideler, Henry, janitor	600 00	
Schanel, R. J., supply clerk	600 00	
Scheibel, Herman, steam fitter	511 90	
Steffen, A. W., janitor	555 00	
Severin, H. C., janitor	20 80	
Schmidt, R. A., statistical work	53 70	

Schmelzer, B., laborer	222 90	
Schmelzer, G., foreman grounds	845 00	
Schleifer, A. C., blue printing, etc	30 45	
Swenson, Chris., carpenter	672 86	
Sladky, A. C., making apparatus	81 70	
Steinke, Laura A., student assistant	51 53	
Schulz, A. E., machinist	32 75	
Schumm, F., laborer	222 80	
Sandberg, S. E., steam fitter	990 00	
Shriner, H. F., machinist	116 70	
Schofield, H., laborer	585 00	
Thayer, B. S., drafting	11 40	
Togstad, J. P., machinist	470 83	
Tende, E. D., team work	64 00	
Trainor, Mrs. J., charwoman	11 10	
Trousdale, Paul, laborer	8 00	
Toellner, Wm., janitor	84 00	
Treutzschler, M. F., machinist	60 00	
Thompson, A. O., electrician	1,200 00	
Upfield, Jessie, chart making	18 75	
VanDerzee, G. W., student assistant	70 10	
Warren, W. L., laborer	1 80	
Warren, W. E., lantern work	2 70	
Wetzel, R. A., lantern work	12 00	
Welton, Rex, stenographer	16 66	
Wiese, Annie, charwoman	5 00	
Webb, Alice L., clerk	105 00	
Wilson, Agnes, cutting stencils	2 00	
Wright, Harry, page	34 00	
Wilson, E. D., laborer	8 20	
Watkins, Mary E., student assistant	35 71	
Willett, Geo., janitor	555 00	
Woodbury, M., watchman	600 00	
Whitney, E. N., student assistant	54 61	
Wehner, S., laborer, janitor	147 70	
Wetzel, Wm., engineer	368 00	
Warner, F. M., clerk	11 75	
Walters, S., laborer	58 28	
Welk, W., typewriting	10 00	
Wilson, D., team work	94 00	
Zapffke, Carl, lettering	4 60	
Zurian, G., laborer	558 00	
Total		$59,817 20

AGRICULTURAL COLLEGE PAY ROLL

1906-1907

Anderson, S., labor	$13 84	
Andrews, J. M., labor	35 50	
Anderson, Ralph, labor	7 50	
Anderson, G., farm hand	103 82	
Amdall, G. M., dairy tests	9 10	
Anderson, A. L., farmer	473 00	
Accola, John, swineherd	555 00	
Aherns, W., labor	83 06	
Bolley, A. K., assistant	1 54	
Borschinger, H., fireman	16 50	
Burke, Minnie, charwoman	6 25	
Bond, Maggie, charwoman	257 81	
Bigelow, Ray, labor	88 46	
Barker, Wm. J., laborer with team	575 83	
Berger, J. H., labor	90 00	
Back, A., laborer	491 14	
Bibbs, Idalyn, clerk and stenographer	492 00	
Beule, E. A., dairy tests	301 23	
Brewster, Antoinette, clerk and stenographer	552 00	
Brown, J. C., dairy tests	120 15	
Benson, Alfred, laborer	60 27	
Cranefield, Paul, picking berries	2 20	
Carroll, Lawrence, picking berries	1 50	
Cobb, Verno, clerk and stenographer	455 38	
Charles, D. B., janitor	600 00	
Clark, W. E., dairy tests	219 69	
Carroll, Edna, stenographer	46 45	

Charles, Robert, picking berries, janitor, etc	14 30	
Carey, Clinton, labor	29 95	
Cranefield, Marion, picking berries	3 60	
Cutler, Cora, charwoman	23 26	
Delsman, T., labor	41 52	
Diebold, J., laborer	4 33	
Doty, E., picking berries	1 70	
Dauck, Henry, farm hand	502 19	
Delwiche, E. J., superintendent	992 64	
Davy, Mary, charwoman	15 01	
Dale, Clarence, picking fruit, etc	180 85	
Dwinnell, Bernice, stenographer	83 12	
Dean, Earl, helper	63 98	
Delwiche, O. J., teamster	441 79	
Dauck, Herman, farm hand	550 00	
Eliason, A. M., labor	7 50	
Esser, Agnes, clerk and stenographer	465 00	
Erickson, E., laborer	45 00	
Eastman, S. A., swineherd	50 00	
Enders, W., farm hand	546 00	
Fowler, Mrs. G. O., boarding men	12 50	
Fox, C. W., assistant	63 00	
Frauenheim, O. R., dairy tests	153 77	
Farley, T., laborer	57 75	
Fehlandt, Elsie, clerical work	61 66	
Fox, E. W., dairyman	500 00	
Fiedler, Anna K., stenographer	719 00	
Gaynor Cranberry Co., labor	7 00	
Gayner, James, labor	17 55	
Gallagher, Cora M., clerical work	41 40	
Griffiths, Nellie E., clerk and stenographer	600 00	
Gaynor, Mrs. James, boarding men	107 25	
Gundlach, A., laundry work	31 27	
Glidden, Violet E., stenographer	88 94	
Gauert, F., cement finisher	663 00	
Hine, George, helper	3 75	
Hoffman, Otis, picking berries	2 50	
Hatch, J. R., dairy tests	620 91	
Henwood, Elizabeth M., bookkeeper	660 00	
Hawley, Blanche, clerical work	57 10	
Hoffman, John, carpenter	790 42	
Hardenberg, C. B., entomologist	183 00	
Hutton, George, foreman	855 00	
Hargrave, W. E., dairyman	180 00	
Hansen, H., laborer	200 76	
Harris, W. M., helper	102 60	
Hornbeck, E., teamster	83 06	
Harris, R. T., dairy tests, etc	61 45	
Houg, G. B., labor	24 00	
Houg, John, laborer	215 75	
Jones, Robert, laborer	10 88	
Jones, Charles, clerical work	30 90	
Kleinheinz, Monica, clerical work	139 82	
Kleinheinz, Carrie, clerical work	10 65	
Knoeppel, Louise, clerk and stenographer	8 46	
Knapp, Glen, clerical work	20 25	
Kornsted, Martin, laborer	42 12	
Kelly, Minnie, clerk and stenographer	423 13	
Kissinger, Henry, laborer	38 88	
Lewis, W. H., laborer	15 00	
Lugger, Humboldt, foreman	50 00	
Linde, C. A., pedigree work	495 90	
Larkin, D. W., laborer and fireman	301 91	
LeMere, S. fireman	76 45	
Lindberg, Victor, laborer	18 15	
Leopold, Theo., laborer	22 15	
Lake, B. J., laborer	168 00	
Larsen, Andrew, laborer	38 75	
Lynch, Margaret, clerk and stenographer	286 91	
Markey, W. H., dairy tests	21 23	
Mitchell, George, laborer	2 32	
Martinson, Ole, laborer	180 83	
Mills, Sadie, clerk and stenographer	480 46	
Martinson, S., farm hand	53 65	
Mitchell, Chas., laborer	15 00	
Mederich, G., laborer	4 38	

Marsh, Earl, laborer	7 00	
Milward, Jas. G., assistant	27 78	
Markey, W. E., assistant	444 00	
Malde O. G., superintendent	674 41	
Mason, Mahala, stenographer	98 08	
Marshall, J. D., laborer	156 53	
McGovern, Thos., labor	32 00	
McComb, C. J., dairyman	900 00	
Marshall, Roy R., assistant	351 65	
Matthews, Jos., teamster	600 00	
Nelson, Martin, assistant	166 55	
Norgord, C. P., dairy tests	82 00	
Nielson, Chester, picking berries	1 00	
Nolan, J., laborer	497 52	
Otterson, Oscar, teamster	70 95	
Olson, A., farm hand	190 38	
Oakey, Minnie, stenographer	58 88	
Probst, Wm., laborer	10 50	
Post, H. L., dairy tests	31 60	
Peterson, Mrs. Hans, charwoman	7 50	
Peterson, Mary, charwoman	6 75	
Price, Mary, charwoman	6 25	
Potoska, Martin, labor	2 00	
Peterson, P. O., farm hand	541 33	
Peterson, Peter, laborer	45 00	
Polley, E. A., picking fruit	87 85	
Provencal, Louis, laborer	2 75	
Powell, M., clerk and stenographer	32 30	
Quan, Clara, clerical work	58 35	
Reynolds, Clara, clerical work	9 90	
Ruzek, Chas., helper	40 65	
Rolleys, A. K., helper	36 17	
Roeder G., laborer	7 88	
Roeder, F., labor	18 73	
Reinking, O. A., picking berries	33 40	
Richards, M. M., laborer	156 56	
Ryall, B. R., assistant	110 00	
Rogers, A. J., labor	370 00	
Rosenthal, E., milker	88 65	
Rogers, Jr., A. J., field assistant	238 23	
Sullivan, Phillip, labor	2 40	
Snaddon, J., labor	17 30	
Smith, Anton, laborer	19 50	
Smith, W. H., labor	12 90	
Strand, J. M., assistant	18 00	
Skeflo, Paul, dairy tests	196 13	
Sandell, Harvey, assistant	726 64	
Schroeder, Chris., herdsman	67 79	
Steffen, H., deliveryman	595 00	
Schwenker, P. F., swineherd	24 05	
Sutherland, Sarah, clerical work	38 48	
Schils, George, helper	16 18	
Smillie, R. K., laborer	145 00	
Schell, Marjory, clerk and stenographer	45 00	
Saville, Anna, clerk	11 00	
Schmelzer, Anna, laundress	68 90	
Sandell, Alfred, picking fruit	23 95	
Sanborn, E. H., dairy tests	109 42	
Stoelting, John, laborer	70 53	
Smithwick, Martin W., laborer	249 00	
Teckmeyer, Ed., laborer	490 78	
Tretsven, J. O., farm hand	477 00	
Voss, Wm., teamster	540 16	
Walker, R. C., dairy tests	155 25	
Willoughby, T. F., shepherd	24 00	
Walters, John, labor	16 15	
Walline, Austin, assistant	9 90	
Watchtrap, W., labor	10 68	
Weir, Wilbert W., assistant	44 79	
Walker, Wm. B., student assistant	60 95	
Warner, E. E., labor	16 00	
Walster, H. L., assistant	30 00	
Wendt, Fred, laborer	452 19	
West, Ray N., dairy tests	330 76	
Wilson, Agnes, clerical work	114 05	
Zerbel, Louis R., assistant	600 00	
Total		$82,055 08

DAIRY AND SHORT COURSE PAY ROLL

1906-07.

Berry, L. S., instructor, salary	$124 98	
Borschinger, Henry, fireman, salary	90 00	
Brown, J. C., instructor, salary	150 00	
Borschinger, John, instructor, salary	60 75	
Cooley, R. S., instructor, salary	102 72	
Dauck, Henry, fireman, salary	45 00	
Gangstad, Julius, instructor, salary	95 00	
Haberstich, A. C., instructor, salary	745 00	
Hine, George, instructor, salary	30 25	
Knight, Chas., instructor, salary	38 70	
Kohel, Louis, instructor, salary	351 83	
Laabs, Arthur, instructor, salary	100 00	
Larkin, Dan, fireman, salary	45 00	
Michels, M., instructor, salary	525 00	
Marty, Gottleib, instructor, salary	600 00	
Murdock, C. R., instructor	17 00	
Moore, J. W., instructor	250 00	
Norris, A. J., instructor, salary	19 00	
Patterson, Roger, instructor	6 50	
Sylvester, Walter, instructor, salary	24 50	
Schembele, E., instructor, salary	154 32	
Smith, Harry L., instructor, salary	281 58	
Simmons, M. L., instructor, salary	125 00	
Schenck, Chris., instructor, salary	100 00	
Sandell, Harvey, instructor, salary	66 66	
Schwingle, Francis, instructor, salary	100 00	
Thuerwachter, Louis, instructor, salary	65 00	
Tormey, John, instructor, salary	26 00	
Tullock, G. A., instructor, salary	22 31	
Total		$4,368 08

AGRICULTURAL INSTITUTE PAY ROLL

1906-07.

Arnold, Alex. A., institute worker, salary	30 00	
Bradley, W. C., institute conductor, salary	285 00	
Bradford, Mary D., instructor, salary	10 00	
Convey, Thos., institute worker, salary	155 00	
Conley, Emma, institute worker, salary	31 00	
Ellis, Theo. I., institute worker, salary	15 00	
Goodrich, C. P., institute worker, salary	30 00	
Hill, Geo. C., institute worker, salary	220 00	
Imrie, David, institute worker, salary	185 00	
Martiny, L. P., institute worker, salary	165 00	
Matteson, C. E., institute worker, salary	185 00	
Roberts, R. E., institute worker, salary	225 00	
Scott, L. E., institute conductor, salary	285 00	
Scribner, F. H., institute conductor, salary	275 00	
Total		$2,096 00

MILK PAY ROLL

1906-07.

Allis, F. W., cream, milk	$2,613 66	
Addison, J., milk	18 24	
Austin, C., hauler	227 37	
Atwood, R. J., milk	19 69	
Albrecht, Wm., milk	3 03	
Albrecht, Chas., milk	6 90	
Albers, Wm., milk	7 66	
Badger Creamery Co., cream	530 47	
Brown, P. W., milk	48 14	
Byrne, D., milk, cream	230 31	
Bilse, M., milk	114 10	
Bakken, Carl, milk	139 13	
Buss, Chas., milk, hauler	3,281 01	
Bartlett, S., cream	236 93	
Behnke, Fred, milk	121 89	
Blizzard, Judson, milk	83 34	

Behnke, Wm., milk	111 75	
Baudran, J., milk	70 00	
Becker, H., milk	100 13	
Burmeister, O., milk	116 46	
Coom, S., milk	6 01	
Comstock, J. P., milk	47 30	
Conlin, J., milk	90 19	
Chynoweth, H. E., milk	256 60	
Curwen, Thos., milk	52 70	
Dinkler, H., milk	271 52	
Dukelon, Frank, milk	63 57	
Dahlk, J., milk	172 67	
Donkle, S., milk	150 63	
Engle, E., milk	195 13	
Easerman, Chas., milk	163 49	
Fergen, Geo., milk	8 43	
Fisher, H. C., milk	4 47	
Fergen, P., milk	133 25	
Fisher, Gus, milk	114 29	
Gallagher, E. L., milk, cream	148 43	
Good, G. F., cream, milk	272 49	
Gay, Henry, milk	24 31	
Gullickson, G., milk	90 44	
Gay, Wm., milk, cream	466 37	
Gallagher, Erwin, milk	45 13	
Gallagher, Mrs. C. E., milk	194 32	
Grabbiet, E., cream	211 93	
Gallagher, Elwin, milk	333 70	
Gallagher, R. F., milk, cream	357 98	
Gillette, R., cream	33 11	
Good, F. W., milk	7 56	
Goorey, J., milk	52 70	
Gill, Wm., milk	1 77	
Gay, Harry, milk	1 45	
Gordan, Jessie, milk	30 53	
Groth, G. H., milk	23 28	
Gordan, Thos., milk	135 10	
Grabandt, Wm., milk	79 82	
Gordan, Geo., milk	35 24	
Grabbiet, R., cream, milk, hauler	1,118 07	
Hassett, J., milk	143 83	
Henderson, A., milk	235 27	
Hoppmann, Chas., milk	161 26	
Hoppmann, J. H. milk	82 87	
Hinrichs, D., milk	59 27	
Hermsmeier, J., milk	58 51	
Huston, Alford, milk	320 72	
Homberg, Aug., milk	232 65	
Huston, D. W., cream, milk	519 92	
Huston, J. A., milk, cream	318 82	
Hoppmann, H. C., milk	167 56	
Huston, H. C., milk	281 38	
Hathaway, Chas., milk	296 30	
Hacker, L., milk	109 54	
Huston, D. W., milk	318 10	
Haak & Albrecht, milk	250 85	
Hammersley, Geo. H., milk, hauling	438 29	
Henderson, N., milk	30 19	
Hansmeier, J., milk	63 54	
Homberg, Wm., milk	109 51	
Hankey, Ralph, cream	44 15	
Hallock, Y., milk	17 16	
Hankey, Rufus, cream	25 32	
Haight, J. C., milk, cream	64 00	
Haak, A., milk	70 35	
Klueter, H., milk	77 34	
Knowlton, J., milk	246 56	
Knickmeier, Frank, milk	36 89	
Klein, C., milk, cream	129 27	
Knickmeier, Fred, milk	51 30	
Kleinheinz, L., cream	11 47	
Klever, H., milk	173 90	
Leighler, Geo., milk	18 68	
Lathan, J. C., milk cream	57 11	
Libby, John, milk	18 68	
Larkin, Dan, hauler	201 70	
Leslie, M., cream	421 02	

Lubcke, Wm., hauler	267 68	
Meyer, O., milk	9 62	
Marks, H. Jr., milk	42 68	
Marty, Mrs. A., milk	59 40	
Marks, P., milk	22 77	
McGaw, S., milk	39 11	
Meincke, L., cream	72 24	
Maher, Wm., milk	129 13	
Malec, V., milk, hauler	738 99	
McKee, Ed., cream	280 93	
Mutchler, P., cream, milk	526 87	
McKee, Wm., milk	74 25	
Maher, T., milk	185 94	
Miller, W. H., milk	500 79	
Marks, H., milk	190 44	
Mashe, C. H., hauler	9 00	
Neibuhr, L., milk	69 69	
Ort, F., milk, hauler	356 21	
O'Brien, E. S., milk, cream	233 81	
Peterson, P., milk	65 11	
Pierstorf, Wm., milk	19 03	
Pyre, J. F. A., cream	4 22	
Pearson, J., milk	1 29	
Pepper, H., milk	21 93	
Pepper, Henry, cream	49 06	
Purcell, Thos., milk	92 32	
Pierstorf, Henry, milk	297 83	
Pledger, Mrs., milk	1 18	
Peters, H., milk	333 90	
Reigle, G. W., milk	32 77	
Radke, Wm., milk	18 19	
Reuter, R., milk	39 43	
Rung, Wm., milk	259 37	
Rodefeld, C. H., cream, milk	261 39	
Schwenn, J., milk	112 22	
Sykes, D., milk	162 29	
Sykes, Ed., milk	87 36	
Showers, Ed., cream	171 09	
Schwenkert, Geo., milk	104 81	
Schroeder, Chas., cream, milk	147 57	
Schutz, Julius, milk	119 13	
Stekelberg, Wm., milk	721 32	
Sharp, Wm. E., milk	130 64	
Schroeder, F., milk	43 81	
Shaffer & Clapper, milk	64 33	
Stelter, H. G., milk	21 80	
Sykes, V., milk	5 93	
Steigman, Mrs. F., milk	81 82	
Steckelberg, F., milk	71 80	
Sprecher, Geo., milk	99 90	
Slater, John, milk	291 70	
Showers, J. E., milk	534 95	
Steinhauer, H. A., milk	46 12	
Synon, Mrs. Mary E., milk	8 41	
Storck, C., milk	293 99	
Schwenn, E., milk	44 71	
Toepfer, A., milk	5 01	
Tiedeman, Mrs. M. J., milk	12 71	
Tiede, John, milk	82 35	
Terwilliger, Wm., milk, cream	75 88	
Terry, H., milk	8 97	
Theiber, H., milk	178 14	
Terry, J. H., milk	43 12	
Ure, N. A., milk	22 63	
Uphoff, Ed., milk	43 77	
Uphoff, F., milk, cream	88 43	
University Farm, milk, cream	1,984 01	
Vroman, H., cream	193 60	
Vial, Ed., cream	17 97	
Vetter, Chas., milk, cream	405 14	
Wrabetz, E., milk	49 98	
Westphal, J., milk	213 88	
Wrabetz, —., milk	2 87	
Waltersheit, Mrs. John, milk	122 42	
Wessenberg, Wm., milk	11 02	
Ward, C., milk	57 76	

Wrabetz & Semb, cream, milk	353 92	
Walbridge, L. J., milk	61 11	
West, S., milk, cream	428 06	
Williams, J. L., milk, cream	153 22	
West Middleton Dairy Assn., cream	11,660 48	
Zarndt, H., milk	14 59	
Zink, E., milk	53 84	
Total		$44,492 39

BAND PAY ROLL

1906-07.

Blankenagle, J. C., musician	$25 00	
DeSautelle, W. T., musician	22 50	
Grobe, E. H., musician	23 00	
Hopkins, C. M., musician	23 00	
Holcomb, Wilber, musician	14 00	
Leasman, E. L., musician	21 00	
Lueck, A. W., musician	24 50	
Lehner, A. P., musician	1 00	
Morris, P. J., musician	2 00	
Mauhart, C. E., musician	2 00	
Purdy, D. F., musician	2 00	
Read, J. B., musician	25 50	
Rankin, E. I., musician	22 00	
Stanley, M. R., musician	23 00	
Springer, B. F., musician	15 00	
VanNatta, J. A., musician	24 00	
Williams, M. L., musician	8 00	
Total		$283 50

DETAILS OF UNIVERSITY PAY ROLLS, 1907–08

UNIVERSITY PAY ROLL, 1907-08.

Anderson, George, laborer	$341 80	
Appuhn, William, janitor	595 00	
Arzberger, Emil G., herbarium assistant	47 20	
Anderson, P. M., electrician	181 30	
Anderson, Tonnes, carpenter	310 76	
Armstrong, Vermillion, chart work	26 50	
Arlake, B., student janitor	10 00	
Annen, Rosa, charwoman	18 15	
Brennan, Mary, charwoman	23 70	
Beyler, Annie, charwoman	20 85	
Barnard, C. R., laundry attendant	36 00	
Buesseler, John, janitor	5 60	
Blake, Mrs. H., charwoman	75 65	
Braun, Frederick C., shop work	590 17	
Bauhs, John, drayman	705 00	
Butler, John, laborer	155 00	
Babcock, John C., janitor	655 00	
Bolzt, John, janitor	655 00	
Boyle, Frank E., swimming attendant	50 00	
Bunker, Alexander, fireman	438 50	
Budd, Frank C., night watch	655 00	
Batty, Chas. H., janitor	655 00	
Brockway, R. A., elevator man	382 50	
Cleveland, O., fireman	16 67	
Cooper, Inez, charwoman	15 00	
Caffrey, Theresa, charwoman	15 75	
Cooper, M. D., student assistant	37 50	
Crary, Wm. C., janitor	462 90	
Carroll, Thomas, fireman	290 00	
Charles, Robert, laboratory helper	35 50	
Cline, William, laborer	600 00	
Chech, Frank, steam fitter	779 01	
Coyne, Chas. O., carpenter	700 70	
Cutler, Cora, charwoman	39 45	
Casserly, Frank, fireman	655 00	
Clifcorn, Henry, fireman	715 00	
Craven, Kate, night watch	268 00	
Cass, Lewis L., night watch	680 00	
Conohan, John E., janitor	655 00	
Duval, E. P. R., student assistant	6 00	
Daniels, Minnie, charwoman	24 45	
Davis, Benj. F., media making	10 50	
Dittmar, Tillie, charwoman	4 05	
Diebold, Chas., laborer	35 00	
Dacey, F. D., painting	79 55	
Doerschuk, J. J., typewriting	35 00	
Dietrich, W. F., janitor	10 35	
Dodd, Roy L., student assistant	43 70	
Diebold, Wm., teamster	600 00	
Dohr, Hugo, carpenter	712 58	
Dyer, Harry, fireman	693 00	
Dake, C. L., student assistant	28 05	
Donlin, John D., janitor	600 00	
Doescher, John, janitor and bells	655 00	
Dresen, John, janitor	535 00	
Deards, W. W., janitor	371 28	
Eastman, John A., special Sunday police	94 00	
Ellis, Thos., engineer	955 00	
Ells, Christina, charwoman	2 70	
Fuss, Gertrude, charwoman	4 05	
Foster, S. D., student laborer	1 20	

Flint, Helen, computer, Observatory	19 50	....
Fliegge, Emily, nurse	50 00	....
Feeley, Lizzie, charwoman	17 55	....
Forbes, Florence, charwoman	60	....
Foss, Chas., laborer	131 20	....
Fuss, Kate, charwoman	20 25	....
Falter, Mrs. Geo., charwoman	47 10	....
Falter, Barbara, charwoman	18 21	....
Fuss, Mary, charwoman	72 83	....
Fry, Wm. G., mechanician	414 72	....
Fitzpatrick, Frances, bell maid	71 20	....
Fitzpatrick, Margaret, bell maid	165 33	....
Faber, M. E., shop work	16 10	....
Gill, Honor L., student assistant	4 93	....
Gurnett, Minnie, charwoman	18 90	....
Grasser, Helen, charwoman	4 25	....
Gomez, Jose, cleaning arms	35 20	....
Gunheim, T. H., carpenter	128 86	....
Goth, W. F., laborer	46 80	....
Gyles, Samuel, carpenter	436 94	....
Grade, Ernest, page, library	184 00	....
Grasser, Mary, janitress	355 00	....
Godding, Frieda M., charwoman	184 58	....
Heil, Mrs. Mary, charwoman	2 70	....
Hillis, Elizabeth, charwoman	8 10	....
Harper, Carl, marking tennis courts	2 75	....
Hammersley, W. C., laborer	4 88	....
Herrlein, Henry, laborer	1 00	....
Haak, Augusta, charwoman	42 45	....
Harman, Horace, painter	303 28	....
Herrlein, Joseph, laborer	9 00	....
Heinz, Adolph; student assistant	60 00	....
Horton, Geo. W., elevator man	90 00	....
Hensey, Chas. D., laborer	141 60	....
Hipple, J. S., mechanician	817 83	....
Herrlein, Val., foreman	660 00	....
Haak, John, laborer	600 00	....
Huebner, Wm., plumber	900 00	....
Harrison, James, fireman	719 00	....
Hammersley, Wm., teamster	645 00	....
Hetzel, Harry C., student assistant	212 59	....
Haak, Mrs. John, charwoman	53 70	....
Helm, Chas., janitor	600 00	....
Heise, George W., swimming attendant	54 00	....
Homouth, E., laboratory work	28 00	....
Johnson, LeRoy, laundry attendant	5 40	....
Janes, M. A., mason	585 00	....
Jones, O. Lloyd, janitor work	2 80	....
Jenner, E. A., making apparatus	11 40	....
Kane, C. C., janitor	580 00	....
Knudson, John, laborer	57 00	....
Kateley, Fred, shop work	76 00	....
Koenig, Herman, shop work	20 40	....
Knapp, Ida, janitress	330 00	....
Knudson, Agnes C., student assistant	41 10	....
Kelley, Minnie, stenographic work	20 00	....
Koenig, H. H., mechanician	66 75	....
Lang, Chas., laborer	3 00	....
Larson, Gustave, fireman	4 84	....
Lemberger, Anna, charwoman	5 40	....
Lees, Walter E., shop work	56 25	....
Leonard, L. D., painter	451 18	....
Lehmann, V. V., media making	42 00	....
Lockwood, Mrs. Robt., charwoman	95 88	....
Lorenz, E. H. J., mechanician	225 97	....
Lyford, Walter, electrician	746 12	....
LeHew, Orley, fireman	801 17	....
Link, Ellen, charwoman	226 00	....
Larson, Gustav, fireman	311 34	....
Lund, J. E., engineer	670 00	....
Lewis, P. A., night watch	308 20	....
Lynaugh, Patrick J., janitor	655 00	....
Montefer, Meta, charwoman	60	....
Murphy, John P., fireman	5 50	....
Miller, Karl F., student janitor	10 00	....
Milward, Mrs., charwoman	4 35	....
Mackesy, T. E., janitor	52 10	....
Mechanic, B., machinist	55 00	....
Miles, Edward L., steam fitter	252 36	....

Meier, Wm., janitor	70 00	
Morgan, George, laborer	44 00	
Moss, Lester M., student assistant	17 30	
Millren, B. L., shop work	219 71	
Mitchell, A. G., steam fitter	472 08	
Moll, Frank, carpenter	724 76	
Mutchler, Irving, chief carpenter	1,200 00	
Mueller, John, janitor	98 06	
Morgensen, S. T., janitor	66 66	
Morschauser, Ernst, supply clerk	600 00	
Morse, Willis, janitor	655 00	
Nolan, M., janitor	375 00	
Nalon, Kate, charwoman	360 00	
Noon, Etta, bell maid	12 66	
Nelson, K. O., research work	20 00	
Outzen, Andrew N., electrician	45 00	
Olson, M. J., painter	2 72	
Post, Walter, hauling sand	14 00	
Post, L. M., mechanician	2 70	
Partridge, Elva E., student assistant library	38 84	
Piper, Homer, page library	86 00	
Payton, Martin, foundryman	451 50	
Post, L. J., laborer	142 06	
Post, William, janitor	600 00	
Robertson, Lena, charwoman	20 25	
Riley, Miles C., student assistant	25 00	
Richards, Clark, student assistant	5 00	
Rattle, Mrs. J. C., charwoman	4 65	
Rosner, Rudolf, mechanician	478 77	
Richards, M., lantern work	49 50	
Redel, Robert, shop work	590 27	
Rasmussen, Gabe, painter	716 25	
Russell, Jesse, engineer	835 00	
Rider, J. H., valve inspector	300 00	
Reese, Lucy, chambermaid	321 76	
Seary, Sarah, charwoman	23 85	
Scheibel, Lizzie, charwoman	4 05	
Sullivan, Colbert, messenger	1 50	
Severin, Harry P., student janitor	9 60	
Sidell, Jennie, charwoman	18 90	
Schumm, F., laborer	25 20	
Saleski, F., charwoman	6 00	
Schulz, A. E., shop work	4 75	
Scherer, Edward, laborer	8 25	
Shenkenberg, Irene, student assistant	4 00	
Smith, John, cleaning rugs	4 00	
Schumm, Marie, charwoman	25 65	
Schwada, J. P., laundry attendant	80	
Stout, A. B., janitor	72 40	
Sladky, A. C., machinist	55 00	
Schmelzer, Ben., laborer	424 20	
Scheideler, Henry, janitor	545 00	
Shriner, H. F., machinist	810 68	
Schubring, A. O., painter	121 50	
Schumm, Robert, laborer	32 00	
Sladky, Paul, shop work	39 98	
Steenbock, Henry, laborer	464 20	
Schmelzer, Girard, foreman	895 00	
Schofield, Henry, laborer	600 00	
Scheibel, Herman, steam fitter	583 66	
Sandberg, S. E., steam fitter	1,020 00	
Swenson, Christ, carpenter	621 98	
Steinke, Laura A., student assistant	172 62	
Shriner, Chas., toolroom attendant	240 00	
Steffen, A. W., janitor	635 00	
Schoening, P., janitor	138 10	
Stafford, H. S., student attendant	109 80	
Sperling, Fred, janitor	98 35	
Schanel, Ray J., supply clerk	710 00	
Sweemer, L. L., janitor	167 25	
Tierney, J. C., shopwork	5 55	
Tschabold, C. A., laborer	2 50	
Talbot, L. R., cleaning arms	1 00	
Terry, Chas. E., janitor	10 95	
Thiele, O. V., clerical work	51 90	
Thuerwachter, Louis, machinist	120 00	
Treutschler, M. F., machinist	113 20	
Tingstad, J., laborer	53 20	
Thompson, Andrew O., electrician	1,200 00	

Toellner, Wm., janitor	130 10	
Van Derzee, G. W., student assistant	74 01	
Van Auken, Clarice, student assistant	18 83	
Woodbury, Milo, janitor	30 00	
Westover, Mabel, charwoman	13 50	
Williams, Mrs., charwoman	24 30	
Woodward, Mrs. Ida, charwoman	10 80	
Whitney, Edward N., student assistant	10 20	
Wehrle, Geo. P., laborer	15 20	
Wadsworth, W. J., drawings	6 30	
Wilson, D., with team	60 50	
Wolffmann, David, laborer	33 84	
Wolffmann, Harry, laborer	20 75	
Watkins, Mary E., student assistant	118 22	
Walter, Salmon S., laborer	398 08	
Wetzel, Wm., engineer	480 00	
Willett, George, janitor	600 00	
Zurian, George, laborer	600 00	
Total		$56,294 81

ADMINISTRATION PAY ROLL, 1907-08.

Abbott, E. P., student assistant	$10 50	
Austin, Eric W., student assistant	50 55	
Bridgman, B. W., lantern work	15 60	
Bersenbrugge, B., clerk	28 25	
Breidenbach, Otto H., student assistant	50 00	
Blankenagle, Emil C., student assistant	84 20	
Blankenagle, John C., student assistant	164 45	
Bodman, Emily, clerk and stenographer	787 50	
Briggs, Sophie M., law librarian	799 92	
Collins, Geo. T., clerk	710 00	
Conlin, John, messenger	21 00	
Conger, J. L., student assistant	4 50	
Doe, Ethelyn A., editorial assistant	500 00	
Doerschuk, J. J., stenographic work	15 00	
Dino, John, student assistant	90	
Dietz, Eugene, labor	1 80	
Davis, Jane, clerical work	8 00	
Dunton, Edith F., clerk and stenographer	75 00	
Donnelly, E. A., assistant in law library	16 38	
Egelhoff, R. F., draughtsman	17 55	
Evans, Magdalen, clerk and stenographer	720 00	
Fisher, S. M., student assistant	5 25	
Faber, M. E., student assistant	5 25	
Froehlich, Arno, clerical work	26 25	
Flint, Helen, computer	82 50	
Feinauer, Bertha K., clerk and stenographer	12 70	
Friedland, Jennie, clerk and stenographer	300 00	
Fliegge, Emily, nurse	450 00	
Flisch, Julia A., assistant University extension	600 00	
Fewson, Edna, purchasing agent	1,250 00	
Gayton, Oscar F., draughtsman	29 40	
Gallagher, Cora M., stenographer	16 00	
Germann, H. L., clerk	5 75	
Gesell, Gerhard A., clerical work	17 40	
Gallistel, Albert F., draughtsman	900 00	
Glen, Mary A., clerk and stenographer	805 00	
Goldschmidt, Wm. J., assisting bursar	24 40	
Hatch, Winnifred, clerk and stenographer	337 09	
Hewett, Mary A., clerical work	6 00	
Huschka, T. F., stenographic work	17 80	
Hoyt, Ralph M., student assistant	6 40	
Hanchett, D. S., student assistant	150 00	
Heinz, Adolph, commandant's clerk	80 00	
Hendley, A. J., stenographic work	11 10	
Hankey, Ira, clerk and stenographer	127 50	
Hiestand, W. D., registrar and secretary of faculty	2,391 66	
Harlacher, Edith C., clerk and stenographer	430 65	
Hayner, Grace H., clerk	780 00	
Hart, Anna, bill clerk	720 00	
Herfurth, Ida, executive clerk	1,191 66	
Ives, Fred W., student assistant	69 43	
Jewett, A. L., student assistant	1 80	
Jemne, Magnus, draughtsman	758 33	
John, Henry W., student assistant	8 20	
Johnson, Leroy, typewriting	27 13	
Knoeppel, Louise, clerical work	15 32	

Kelley, Minnie, stenographer	45 00	
Klug, Benjamin W., student assistant	3 30	
Lambeck, A. H., student assistant	84 00	
Lewis, P. A., clerk and stenographer	105 00	
Landesco, Jack A., student assistant	5 40	
Leonard, Albert, clerical work	166 00	
Leute, Helena, clerk and stenographer	542 50	
Lawrence, Edward J., messenger	293 00	
Lundberg, Emma O., clerical work	118 10	
Myers, P. H., student assistant	16 25	
Moe, M. W., typewriting	6 00	
Myers, Harold B., student assistant	18 40	
McWethey, H. E., draughtsman	3 60	
Munsell, Grace, stenographic services	24 00	
Miner, O. H., typewriting	10 40	
Mayo, E. L., stenographic work	2 40	
Mason, Mahala A., stenographer	118 36	
McKee, Elizabeth, clerk and stenographer	241 94	
McDougall, Earl, student assistant	50 00	
Moss, Lester M., clerical work	48 00	
Matson, Bertha M., stenographic work	355 67	
McConnell, A. W., superintendent buildings	1,200 00	
Merz, Aline, clerk and stenographer	600 00	
Martin, Georgia M., clerk and stenographer	585 00	
Merrick, Geo. B., accountant	1,191 66	
McCaffrey, M. E., acting secretary regents	1,770 00	
Nebel, Albert, clerical work	32 00	
Parsons, Claire, stenographer	100 00	
Peabody, Arthur, supervising architect	3,000 00	
Pickarts, Lucien J., bursar, regents	1,775 00	
Post, Mabelle M., clerk and stenographer	465 00	
Quigley, W. J., typewriting	2 75	
Randolph, Mabel, clerk and stenographer	908 95	
Richards, M., lantern work	38 70	
Rinder, Mathilda L., clerk	371 50	
Rose, Margaret, stenographic work	16 00	
Retelstorf, Caroline D., student assistant	16 10	
Salter, Hortense, stenographic work	51 66	
St. John, Henry, student assistant	3 30	
Schnell, Lottie I., clerical work	90 00	
Smith, Glen E., student assistant	17 80	
Stout, A. B., student janitor	13 20	
Schlosser, Ormel, stenographer	4 00	
Steinfort, Carl E., clerical work	10 40	
Sutherland, Ross, typewriting	5 90	
Sanford, Delia C., clerical work	3 25	
Steere, Metta E., typewriting	3 10	
Spencer, Katherine, stenographer, regents	991 63	
Schmelzer, Henry, messenger	255 00	
Sanford, Fannie G., stenographer and clerk	720 00	
Sullivan, Helen, stenographer	585 00	
Sasman, Eunice, clerk and stenographer	378 00	
Sage, May L., stenographer	550 00	
Stromme, Esther, stenographer	400 00	
Smith, Maud E., student assistant	167 30	
Sladky, A. C., clerical work	50 75	
Snyder, Matilda L., record work	283 17	
Schoetz, Max, typewriting	39 50	
Smith, James M., draughtsman	1,200 00	
Titsworth, Paul E., typewriting	6 00	
Tormey, Regina, clerk	109 10	
Taylor, Herbert C., stenographic work	6 30	
Tierney, J. T., correcting papers	12 00	
Thiele, O. V., student assistant	15 75	
Timberlake, Violet S., assistant to registrar	720 00	
Turneaure, Florence, clerk and stenographer	710 00	
Thompson, Beulah A., clerk and stenographer	250 00	
Van Auken, Kenneth, student assistant	14 25	
Van Auken, Claude L., student assistant	7 00	
Van Auken, Clarice, student assistant	64 25	
White, Rhoda M., clerical work	110 00	
Wadsworth, M. Harriet, stenographer	18 30	
Wilcox, Jessie, clerk	590 00	
Wilkinson, Julia M., secretary to president	991 63	
Webb, Alice L., clerk and stenographer	715 00	
Werner, Max A., student assistant	76 50	
Wulfing, Alice, clerk and stenographer	535 00	
Welsh, Iva A., librarian	775 00	
Yager, R. M., student assistant	29 65	
Total		$41,628 74

AGRICULTURAL COLLEGE PAY ROLL, 1907-08.

Anderson, A. N., laborer	$162 68	
Accola, John, swineherd	650 00	
Ahrens, W., laborer	546 00	
Anderson, A. L., foreman	600 00	
Bidwell, W. E., student assistant	30	
Barker, Willie, picking fruit	2 10	
Bergh, R., picking berries	60	
Bloomer, L., picking berries	2 90	
Ballis, George, labor	1 87	
Bibbs, Idalyn, clerk and stenographer	483 00	
Bigelow, Ramond, labor	404 00	
Barker, W. J., labor	492 50	
Brewster, Antoinette G., clerk and stenographer	631 00	
Bond, Margaret, charwoman	318 09	
Berger, John H., laborer	214 50	
Basco, A. S., helper	54 92	
Back, A., laborer	350 00	
Butler, John, orchard work	90 60	
Bryan, Lilllian, stenographer	27 00	
Bentley, Robert, clerical work	10 20	
Beucus, Wm., clerical work	307 41	
Charles, Wm. M., clerical work	1 80	
Charles, Mortimer, labor	4 00	
Cranefield, Paul, picking berries	3 75	
Cranefield, Marion, picking berries	3 75	
Charles, Lucille, clerk	17 40	
Charles, D. B., janitor	655 00	
Curtis, Joseph E., student helper	34 35	
Cutler, Cora, charwoman	317 47	
Charles, Robert, student labor	23 05	
Carroll, Edna, stenographer	359 45	
Cobb, Verna, clerk and stenographer	475 00	
Clark, W. E., dairy tests	100 72	
Delsman, Thos., laborer	45 00	
Douglas County Poor Farm, labor	32 75	
Dodge, Newell, picking berries	1 60	
Danz, Fred, labor	3 00	
Dow, George L., helper	52 50	
DeGuire, George, labor	92 50	
Dudgeon, S., laborer	90 04	
Dauck, Herman, teamster	600 00	
Henry Dauck, fireman	587 61	
Delwiche, O. J., herdsman	660 00	
Delwiche, E. J., superintendent	1,183 33	
Ellermann, August, labor	19 11	
Ely, J. O., labor	15 70	
Enders, W., laborer	576 00	
Esser, Agnes, clerk and stenographer	571 00	
Feldt, John, labor	2 00	
Ferguson, Lester, labor	55 35	
Fuss, Kate, charwoman	11 25	
Fox, E. W., dairyman	744 69	
Fox, Charles W., dairyman	599 50	
Fiedler, Anna K., proof reader	830 00	
Fehlandt, Elsie, clerical work	20 00	
Gaynor Cranberry Co., labor	7 24	
Gratz, M., picking berries	1 50	
Gapen, C. E., student assistant	18 70	
Gundlach, A., laundry work	32 56	
Gaynor, Mrs. James, boarding men	74 15	
Gardner, Willis H., dairy tests	388 09	
Griffiths, Nellie, clerk and stenographer	710 00	
Gauert, F., cement finisher	696 00	
Houg, George B., labor	44 00	
Houg, John, labor	282 75	
Hornbeck, E., teamster	126 33	
Hopple, Henry, labor	19 11	
Hoffmann, Otis, picking berries	9 75	
Humphreys, J. M., laborer	43 75	
Hoffman, Fritz J., laborer	24 00	
Hutchinson, J., picking berries	2 25	
Harper, C., picking berries	5 00	
Howson, Arthur, picking berries	2 25	
Hansen, Carl, labor	50 15	
Hutton, George, foreman	900 00	
Henning, W. E., teamster	483 06	

Hoffmann, John, carpenter	845 10	
Henwood, Elizabeth, bookkeeper	770 00	
Hansen, Helmer, labor	65 38	
Hatch, James R., dairy tests	655 79	
Hayward, C. H., laboratory assistant	15 20	
Hardenberg, C. B., entomologist	315 00	
Hammersley, W. C., student assistant	54 70	
Johnson, James, laborer	42 65	
Jones, Robert, laborer	12 00	
Jorgenson, Arthur, labor	5 00	
Jewett, N. L., clerical work	17 93	
Jones, Myrtle, clerk	15 08	
Johnston, F. R., dairy tests	132 62	
Jones, Robert, labor	12 00	
Knoeppel, Louise, stenographer	54 75	
Kunze, Wm., labor	1 40	
Kahl, Laura, clerk	12 75	
Kissinger, Henry, labor	43 00	
Kelley, Minnie, clerk and stenographer	595 00	
Kleinheinz, Monica, clerical work	297 15	
Kleinheinz, Adelaide, clerical work	86 85	
Kirst, Ernst, laborer	495 69	
Loomer, C. J., labor	4 90	
Lund, Andrew, labor	13 00	
Linde, C. A., pedigree work	220 60	
Leith, B. D., clerical work	8 90	
Larkin, D., laborer	505 00	
Lynch, Margaret, clerk and stenographer	535 00	
Lewis, Ethel M., clerical work	59 70	
Lathrop, H. N., student assistant	12 65	
Lachmund, Robert, dairy tests	257 53	
Moore, George, laborer	3 00	
Madrisch, Frank, laborer	2 62	
McCarthy, Eugene, labor	2 25	
Musback, F. L., laboratory assistant	10 20	
McGovern, Thomas, labor	2 00	
McVannel, A. P., labor	12,00	
Matson, J. E., student assistant	1 10	
Mason, Mahala, clerk and stenographer	23 10	
Meyers, H. B., laborer	61 84	
Martinson, Ole, laborer	110 76	
Moore, Roger, laborer	2 00	
McComb, C. J., dairyman	864 54	
Meyers, H., laborer	90 00	
Michels, Henry, dairy tests	77 66	
Moen, H. C., labor	83 06	
Malde, O. G., assistant	900 00	
Marshall, R. R., assistant	623 50	
Mills, Sadie, clerk and stenographer	595 00	
Mitchell, George, labor	10 60	
Markey, W. E., milker	810 87	
McManners, R. S., helper	88 04	
Mensch, Arthur, fireman	51 30	
Markey, Walter H., dairy tests	151 19	
Matthews, Jos., teamster	655 00	
Nelson, H. P., dairyman	88 50	
Nolan, J., laborer	576 00	
Oesterich, L. J., labor	83 06	
Osterhuis, A. C., student assistant	48 70	
Oakey, Mildred, stenographer	568 00	
Olson, Knute, laborer	29 37	
Potaska, Martin, labor	3 00	
Ploeckelmann, Wm., labor	27 00	
Peck, Henry M., dairy tests	56 00	
Petran, Margaret, stenographer	100 00	
Potter, George F., orchard work	363 46	
Peterson, Wm., labor	79 04	
Porter, W. L., laborer	57 05	
Post, E. H., labor	66 70	
Peterson, Peter O., teamster	450 00	
Peterson, Perry O., assistant	186 00	
Polley, Flossie I., clerical work	123 03	
Peters, John, labor	95 21	
Quan, Clara E., clerical work	176 01	
Rosenthal, E., helper	2 40	
Reid, James, labor	52 00	
Replinger, Roy, picking berries	2 90	
Richards, M., laborer	148 92	
Ryall, B. R., assistant	37 10	

Roberts, Thos., labor	83 06	
Ruskell, E., laborer	408 25	
Ruzek, E. V., student assistant	34 30	
Rogers, J. H., laborer	509 37	
Stoelting, John, labor	4 55	
Smith, G. E., laborer	112 49	
Showalter, Winifred, clerk	6 82	
Salsman, J., picking berries	85	
Schelbel, Mrs., charwoman	11 25	
Schroeder, W. C., laborer	154 61	
Schelter, Dominic, labor	15 00	
Shower, W. L., clerk	53 40	
Sheehy, Etta, stenographer	84 80	
Sandell, Harvey, assistant	799 94	
Snaddon, J., laborer	698 90	
Sutherland, Sadie, clerk	31 68	
Steffen, H., deliveryman	710 00	
Skeflo, Paul, dairy tests	415 55	
Schwartz, Susie, clerk and stenographer	303 78	
Steenbock, H., helper	37 75	
Schmelzer, Anna, laundress	74 50	
Shine, Maggie, charwoman	119 85	
Tennet, Alfred, labor	6 13	
Turner, Charles L., dairy tests	67 32	
Teckmeyer, E., laborer	189 00	
Towle, Timothy, student assistant	60	
Thuerwachter, Louis, laboratory assistant	20 00	
Vaughan, Lulu, clerk	5 40	
Voss, Wm., herdsman	588 00	
Veerhusen, Letta, clerical work	48 08	
Van Auken, C., picking berries	1 00	
Weller, Paul, labor	4 00	
White, Wm., student assistant	2 00	
Wollerman, C. H., student assistant	1 10	
Whittlesey, S. N., livery	3 00	
Wise, Gladys, picking berries	1 00	
Wise, Kathryn, picking berries	1 00	
White, Frank, labor	5 81	
Walker, Ray C., dairy tests	142 57	
Weifenbach, F., labor	96 18	
Warner, E. E., labor	26 00	
Wendt, Fred, labor	506 10	
West, Ray N., dairy tests	434 74	
Weir, W. W., assistant	50 03	
Walster, H. L., laboratory assistant	255 00	
Yates, Bertha, clerk and stenographer	99 81	
Zerbel, Lewis, assistant	720 00	
Zerbel, August, laborer	12 25	
Total		$40,520 23

CREAMERY PAY ROLL, 1907-08.

Albers, William, milk	$22 36	
Allis, F. W., cream	1,502 18	
Addison, Jno., milk	79 57	
Albrecht, Chas., milk	54 34	
Atwood, R. J., milk	46 55	
Addison & Doran, milk	52 68	
Badger Creamery, cream	643 04	
Bartlett, S., cream	30 82	
Bible, Guy, cream	9 75	
Buss, Chas., milk	3,036 53	
Backus, Chas., cream	157 63	
Blizzard, Judson, milk	93 61	
Berry, C., milk	2 95	
Binger, Herman, milk	108 54	
Behnke, William, milk	77 88	
Bryant, L. D., milk	44 98	
Bakken, Carl, milk	219 14	
Brown, P. W., milk	81 72	
Buss, Chas., hauler	249 00	
Bilse, M., milk	135 22	
Baker, H., milk	93 44	
Bunge, Wm., milk	52 45	
Bush, A. O., milk	27 90	
Behnke, Fred, milk	92 30	
Byrne, D., milk	163 48	
Curwen, Thos., milk	60 46	

Conlin, John, milk	133 45	
Comi, Sam, milk	18 36	
Comstock, J. P., mdse.	2 80	
Chynoweth, H. E., milk	289 53	
Donkle, Sye, milk	143 01	
Dinkler, Henry, milk	340 04	
Douck, J., milk	21 96	
Dreger, Henry, milk	85 14	
Dreger, Carl, cream	432 82	
Easerman, Chas., milk	203 48	
Engel, Emil, milk	156 41	
Fisher, Henry C., milk	87 13	
Fisher, George, milk	58 33	
Fisher, Gus, milk	18 25	
Fergen, George, milk	146 68	
Fergen, Peter, milk	169 93	
Good, G. F., milk and cream	342 69	
Grabrant, Wm., milk	49 15	
Grabbiet, Emil, milk	146 84	
Groth, E. F., cream	1,049 68	
Groth, Frank, milk	189 27	
Gullickson, G., mdse.	68 67	
Goth, Wm., milk	85 90	
Gregg, H. B., cream	127 77	
Grabbiet, A. B., milk	8 84	
Groth, George, milk	112 07	
Gordan, George, milk	108 54	
Gordan, Jesse, milk	78 56	
Gallagher, R. F., cream	311 17	
Grabbiet, R., hauler	144 00	
Gay, Harry, milk	18 08	
Gay, William, milk and cream	222 97	
Gallagher, E. L., mdse.	54 89	
Gay, Henry, milk	44 47	
Gordan, Thomas, milk	155 47	
Gallagher, Erwin, milk	195 41	
Grabbiet, R., milk	1,679 48	
Gillette, Rufus, milk	188 70	
Homberg, August, milk	218 74	
Hinrichs, D., milk	259 44	
Hassett, James, milk	173 92	
Hatfield, H., milk	3 28	
Hallock, H., milk	53 67	
Huston, Alford, milk	299 66	
Hoffman, Chas., milk	145 35	
Huston, J. A., milk	342 42	
Hoffman, H. C., milk	211 59	
Hammersley, Geo., milk	103 45	
Herrling, William, milk	4 96	
Hathaway, Chas., milk	504 57	
Huston, D. W., milk	903 36	
Haak & Albrecht, milk	308 89	
Huston, H. C., mdse.	251 60	
Hermsmeier, J., milk	90 84	
Hoppman, Jno. H., milk	171 98	
Haak, A., milk	46 31	
Henderson, A., milk	163 98	
Hambrecht, J., cream	66 37	
Helgeland, S. L., milk	33 64	
Hambrecht, Frank, milk	53 33	
Klein, Fred, milk	4 08	
Klever, Henry, milk	497 80	
Luke, C., milk	8 56	
Leslie, Magnus, cream	552 08	
Laurence, Geo., milk	33 97	
Leslie, Wm., milk	8 61	
Legler, Geo., milk	31 09	
McKee, William, milk	196 57	
Maher, Wm., milk	2 71	
McKee, E. J., cream	382 51	
Model Creamery Co., cream	71 88	
Marty, Mrs. A., milk	97 57	
Miller, W. H., milk	264 71	
Meister, Ludwig, milk	16 30	
Maher, Timothy, milk	203 26	
Mutchler, Ph., cream	570 94	
Maische, C., hauler	798 00	
Marks, Henry, milk	279 89	
Niebuhr, L., milk	89 30	

Niehus, Carl, milk	48 36	
O'Brien, E. S., milk	354 17	
Ort, Fred, milk	613 57	
Penfield, A., milk	163 51	
Pledger, Mrs. C. E., milk	14 69	
Peters, Henry, milk	329 90	
Pierstorf, Henry, milk	348 79	
Runge, William, milk	183 92	
Rodefeld, C. H., milk and cream	266 07	
Ramsfield, Ed., milk	22 37	
Reigel, E. W., milk	33 80	
Ryder, B., milk	27 67	
Showers, Ed., milk	184 06	
Sharp, William, cream and milk	140 16	
Steigman, Mrs., milk	59 60	
Sprecher, Geo. W., milk	55 34	
Stekelberg, Fred, milk	139 82	
Steckelberg, William, milk	732 92	
Schutz, Julius, milk	94 46	
Slater, John, milk	302 61	
Steinhauer, Henry, milk	27 83	
Synon, Mary, milk	47 28	
Sweeney, Pat, milk	103 71	
Schroeder, Chas., milk	158 29	
Schwenkert, Geo., milk	132 08	
Schimming, J., milk	87	
Sprague, H., milk	52 55	
Stork, Casner, milk	275 98	
Schwenn, Emil, milk	261 75	
Showers, J. E., milk	465 66	
Tiedeman, John, milk	9 26	
Theilke, Louis, milk	55 83	
Tipple, M. H., cream	279 99	
Terry, J. H., milk	23 69	
Tiede, John, milk	95 84	
University Farm, cream	1,712 38	
Uphoff, E., milk and cream	325 31	
Uphoff, Frank, milk and cream	161 25	
Vroman, H., cream	49 44	
Vetter, Chas., cream	378 13	
Vezemkie, Paul, milk	31 84	
Walbridge, L. J., milk	65 85	
Westfahl, Jno., milk	207 30	
Wissenberg, William, milk	93 46	
West Middleton Dairy Assn., butter	27,285 06	
Ward, C., milk	142 32	
Williams, J. C., cream	13 03	
Waltersheit, Mrs. J., milk	5 77	
Warner, E. N., milk and cream	24 49	
West, Stanley, cream	216 99	
Wrabetz & Semb, milk	457 72	
Wallin, B., milk	79 50	
Williams, J. L., cream	268 76	
Zink, Erwin, milk	17 35	
Total		$61 185 15

AGRICULTURAL INSTITUTE PAY ROLL, 1907-08.

Armstrong, Mrs. Helen, institute worker, salary	$525 00	
Allen, Elizabeth, institute worker, salary	10 00	
Bradley, W. C., institute worker, salary	245 00	
Brigham, D. E., institute worker, salary	230 00	
Clift, Edith L., institute worker, salary	160 00	
Convey, Thomas, institute worker, salary	10 00	
Elliott, Andrew, institute worker, salary	50 00	
Fraser, W. J., institute worker, salary	25 00	
Griswold, H. D., institute worker, salary	140 00	
Herbst, J. I., institute worker, salary	285 00	
Harring, J. D., institute worker, salary	40 00	
Howie, Mrs. Addie F., institute worker, salary	345 00	
Imrie, David, institute worker, salary	345 00	
King, F. H., institute worker, salary	10 00	
Mattison, C. E., institute worker, salary	260 00	
Martiny, L. P., institute worker, salary	285 00	
McKerrow, W. A., institute worker, salary	155 00	
Meredith, Mrs. Virginia C., institute worker, salary	20 00	
Nordman, E., institute worker, salary	300 00	
Roberts, R. E., institute worker, salary	285 00	

Stiles, W. F., salary	160 00	
Scott, L. E., institute worker, salary	345 00	
Scribner, F. H., institute worker, salary	330 00	
Wylie, George, institute worker, salary	90 00	
Wing, Jos. E., institute worker, salary	40 00	
Total		$4,710 00

DAIRY AND SHORT COURSE INSTRUCTORS' PAY ROLL, 1907-08.

Barker, E. S., instructor, salary	$43 00	
Berry, L. S., instructor and labor, salary	318 00	
Clark, W. E., farm dairy, salary	225 00	
Cooley, R. S., intake, salary	123 55	
Cooper, W. H., butter making, salary	432 00	
Davis, J. A., pasteurizer, salary	118 37	
Frank, J. L., boiler firing, salary	215 76	
Griep, Otto, intake, salary	196 13	
Haskins, H. J., cheese making, intake, salary	172 25	
Haberstich, A. C., dairy machinery, salary	665 00	
Hass, B., intake, salary	15 48	
Jacobs, J. A., intake, salary	64 52	
Kadonsky, J. F., drawing, salary	50 50	
Mensch, A., boiler firing, salary	124 24	
Michels, M., cheese and butter scoring, salary	1,771 17	
McManners, Ray, assistant in laboratory, salary	4 10	
Moore, J. W., cheese making, salary	300 00	
Meyers, M. H., butter making, salary	41 66	
Marty, G., foreign cheese, salary	875 00	
Post, H. L., assistant farm dairy, salary	125 00	
Pierce, L. S., separator, salary	100 00	
Prausa, F. A., pasteurizer, salary	16 50	
Reubensaal, F. J., pasteurizer, salary	416 19	
Singler, J. J., dairy machinery, salary	180 00	
Schmelzer, A. J., cheese making, salary	100 00	
Sylvester, W. W., student assistant laboratory	120 00	
Thuerwachter, L., student assistant laboratory	150 00	
Weir, W. E., instructor	7 00	
Total		$6,970 42

BAND PAY ROLL, 1907-08.

Bissell, W. W	$2 00	
Blankenagel, J. C	25 00	
Blake, G. B	17 50	
Disque, R. C	2 00	
Deihl, J. D	18 00	
DeSautelle, W. T	25 00	
Diestler, G. A	13 00	
Gielow, W. C	12 00	
Geyer, A. N	16 50	
Hintze, P. H	2 00	
Hopkins, C. M	10 00	
Holcomb, W. J	21 00	
Kennedy, M. V	2 00	
Luke, O. V	5 00	
Lendirs, E. A	2 00	
Morris, P. J	10 00	
Mann, C. A	27 00	
Milstein, W. C	27 00	
Nelson, O. O	2 00	
Pengelly, R. L	18 00	
Plagge, H. J	10 00	
Rankin, E. I	17 00	
Robertson, A. H	16 00	
Springer, B. F	10 00	
Tarrell, A. L	16 00	
Titus, M. E	2 00	
Williams, F. E	6 00	
Zobel, E. H	16 00	
Total		$350 00

TRAINING OF TEACHERS PAY ROLL, 1907-08.

Bole, S. J.	$70 00	
Billington, Kate	20 00	
Cornish, Adeline	20 00	
Carter, Theda	20 00	
Dengler, Clare	20 00	
Edgar, Mary	20 00	
Fischer, Anna	20 00	
Hoyer, Elnora	20 00	
Huber, Dora	20 00	
Jenkins, Sara D.	70 00	
Jones, Rennette	20 00	
Kleinpell, Irma	70 00	
Kavanaugh, Cecelia	20 00	
Lessig, Lida	20 00	
Moseley, Anna	70 00	
Murphy, Julia	70 00	
Marvin, Adeline	20 00	
Nelson, Florence	20 00	
Oleson, Mary	20 00	
Pelunek, Viola	20 00	
Parsons, Emily	20 00	
Riley, Martha	20 00	
Reichert, Lorena	20 00	
Surrey, F. M.	70 00	
Steve, Fannie	20 00	
Smith, Matilda	20 00	
Sutherland, Adda	20 00	
Wiswall, Irma	20 00	
Warning, Minnie C.	70 00	
White, Melvin J.	70 00	
Total		$1,000 00

AGRONOMY BUILDING, COLLEGE OF AGRICULTURE, UNIVERSITY OF WISCONSIN, ERECTED IN 1907.

AGRICULTURAL ENGINEERING BUILDING, COLLEGE OF AGRICULTURE, UNIVERSITY OF WISCONSIN, ERECTED IN 1907.

TWENTY-FOURTH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

UNIVERSITY OF WISCONSIN

For the year ending June 30, 1907.

MADISON
Democrat Printing Company, State Printer
1907

☞ The Bulletins and Annual Reports of this Station are sent free to all residents of the State upon request.

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UNIVERSITY OF WISCONSIN

Agricultural Experiment Station

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M. P. RAVENEL, Bacteriologist.
E. P. SANDSTEN, Horticulturist.
A. R. WHITSON, Soil Physicist.
F. W. WOLL, Chemist.
E. G. HASTINGS, Assistant Bacteriologist.
J. G. MOORE, Assistant Horticulturist.
C. A. OCOCK, Agricultural Engineer.
D. H. OTIS, Animal Nutrition.
J. L. SAMMIS, Assistant Dairy Husbandman.
C. W. STODDART, Assistant Soil Physicist.
J. ACCOLA, Assistant in Animal Husbandry.
G. H. BENKENDORF, Assistant in Dairy Husbandry.
E. J. DELWICHE, Supt. Northern Wis. Sub Stations. (Iron River, Wis.)
O. J. DELWICHE, Assistant in Animal Husbandry.
J. G. FULLER, Assistant in Animal Husbandry.
R. T. HARRIS, Assistant in Dairy Tests, Fertilizer, and Feed Inspection.
A. C. HABERSTICH, Assistant in Dairy Husbandry.
G. S. HINE, Assistant in Fertilizer and Feed Inspection.
C. HOFFMANN, Assistant in Agricultural Bacteriology.
LOUISE M. JAHNS, Assistant in Soils.
E. R. JONES, Assistant in Soils and Drainage.
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O. G. MALDE, Assistant in Cranberry Investigations. (Grand Rapids, Wis.)
E. V. McCOLLUM, Assistant in Agricultural Chemistry.
C. J. McCOMB, Assistant in Animal Husbandry.
G. MARTY, Assistant in Dairy Husbandry.
M. MICHELS, Assistant in Dairy Husbandry.
J. G. MILWARD, Assistant in Horticulture.
G. A. OLSON, Assistant in Agricultural Chemistry.
A. J. ROGERS, JR., Assistant in Horticulture.
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General Offices and Departments of Agricultural Chemistry, Animal Husbandry, Bacteriology, Farmers' Institutes, and Library, in Agricultural Hall, west of University Hall.

Dairy Building and Joint Horticulture-Physics Building, west end of Observatory Hill, near Agricultural Hall; Agricultural Engineering and Agronomy Buildings, south of Agricultural Hall.

Telephone connections to Station Offices and Barns.

LETTER OF TRANSMITTAL.

MADISON, WISCONSIN, October 28, 1907.

To His Excellency, JAMES O. DAVIDSON,
Governor of Wisconsin.

I have the honor to transmit to you herewith, in accordance with the law, the Twenty-fourth Annual Report of the Agricultural Experiment Station of the University of Wisconsin.

Respectfully,
W. D. HOARD,
President of the Board of Regents.

REPORT OF THE DIRECTOR.

H. L. RUSSELL.

The Twenty-Fourth Annual Report of this Experiment Station covers the fiscal year ending June 30, 1907.

This year marks an epoch in the history of the Wisconsin Agricultural Experiment Station. Professor Henry is forced by the condition of his health to retire from the duties of Director of the Experiment Station, as well as those of Dean of the College of Agriculture. For twenty-seven years he has labored incessantly for the up-building of Wisconsin agriculture. Two years prior to the establishment of the Experiment Station in 1887 from funds given by Congress, he had induced the state legislature to begin the work of agricultural research. His work has been that of a pioneer,—a path-maker rather than a path-finder,—for in those early days there was no precedent which could be followed in outlining the work.

The woodsman with ax in hand who blazes a trail through the trackless forest performs a service that later generations should never fail to recognize. The foundations which Professor Henry has laid, with the assistance of his colleagues, have been of inestimable value not only to the State, but to the world at large. In laying down his executive duties as Dean of the College and Director of the Experiment Station, Professor Henry does not sever his connection with the University, but will remain as Emeritus Professor, by resolution of the Board of Regents, which was adopted and engrossed in June 1907, as follows:—

"*Resolved,* That the Regents of the University of Wisconsin accept with great regret the resignation of Professor

William Arnon Henry as Dean of the College of Agriculture and Director of the Experiment Station, and hereby appoints him Emeritus Professor in the University.

"In taking this action the Regents desire to express to Professor Henry their profound appreciation of his distinguished service to the cause of agricultural education in the state and nation during the twenty-seven years of his connection with this University, a service that has contributed much to the advancement and prosperity of the commonwealth and placed all its citizens under obligation to him.

"They tender to him the assurance of their continued regard and high esteem and express the hope that relief from the burden of executive duties may restore his health and strength, now impaired by long devotion to the service of the state."

It is hoped that freedom from administrative duties may enable Professor Henry to continue for many years to aid not only Wisconsin farmers, but American agriculture as well.

CHANGES IN STAFF.

The personnel of the staff of this Station has been unusually stable, but of necessity changes must occur from time to time. The following appointments and promotions have been made during the past fiscal year:—

Dr. H. L. Russell, who has been associated with the Station and College for the past fourteen years as head of the Department of Bacteriology, was elected Dean and Director.

The resulting vacancy in the Department of Bacteriology has been filled by the election of Dr. Mazÿck P. Ravenel, Assistant Medical Director and Bacteriolcgist of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis, at Philadelphia. Dr. Ravenel comes with an international reputation as a bacteriologist. For eight years he was bacteriologist of the Pennsylvania Live Stock Sanitary Board and his work on bovine and human tuberculosis and their interrelations attracted much attention at home and abroad. Dr. Ravenel's wide experience in animal pathology will strengthen our bacteriological work in this important direction.

The Department of Chemistry has been materially strengthened by the appointment of Dr. E. V. McCollum, of Yale University, to the position of instructor in Agricultural Chemistry, and of S. K. Suzuki, formerly chemist of the Experiment Station at Formosa, Japan, as research assistant. The time of both of these men will be given entirely to Experiment Station work.

Dr. J. L. Sammis, who during the past year was engaged by the United States Department of Agriculture in co-operative cheese work at this Station, has been appointed Assistant Professor of Dairying, in which position he will continue the cheese investigations previously inaugurated.

Mr. Mathias Michels has been appointed Assistant in Dairying and placed in charge of the butter and cheese scoring exhibitions, a new line of work started this past year.

Owing to ill health, Prof. E. H. Farrington has been given a leave of absence by the Board of Regents for the fiscal year 1907–1908.

Mr. J. G. Moore has been promoted from Instructor to Assistant Professor of Horticulture. During the first semester of the present fiscal year he is in charge of this department, while Prof. E. P. Sandsten is on leave of absence.

Mr. J. G. Milward has been promoted from Assistant to Instructor in Horticulture.

Mr. A. J. Rogers, Jr., a graduate of our institution of last year, has been appointed Assistant in Horticulture and placed in charge of the field work on tobacco.

Mr. Conrad Hoffmann, formerly Assistant, has been promoted to Instructor in Bacteriology and this year will have charge of most of the field work in tuberculosis testing. Mr. Hoffmann's place as Assistant in laboratory has been filled by the appointment of Karl W. Smith, of Philadelphia.

Dr. A. F. McLeod, Instructor in the Department of Soils, resigned in October of this year, to accept a position in the University of Chicago. The vacancy has been filled by the appointment of Miss Louise Jahns as Assistant in the Department of Soils, her work for the present year to be confined to research work connected with the Experiment Station.

Prof. D. H. Otis has been promoted from Assistant Professor to Associate Professor of Animal Nutrition.

Mr. C. A. Ocock, formerly Instructor in Agricultural Engineering, has been promoted to the position of Assistant Professor and is in charge of the department.

Mr. C. S. Knight, a graduate of this University in the class of 1907, has been appointed Assistant in Fertilizer and Feed Inspection.

Mr. O. G. Malde has been appointed Assistant in cranberry investigations, and is in charge of the cranberry station at Cranmoor.

Prof. A. R. Whitson resumed his duties as head of the Department of Soils at the opening of this college year, having returned from Europe, where he spent the second semester of the last year in study.

RESOURCES OF THE STATION.

The Adams Fund.—The financial resources of the Station have been materially increased during this last fiscal year by the passage of the law by Congress on March 16, 1906, which ultimately will give to each of the state experiment stations $15,000 per year, in addition to the amount which is now received from the Hatch Fund. This new accession to the funds for agricultural research was due to the untiring efforts of the late Hon. Henry Cullen Adams, member of Congress from this District. The significance of this appropriation to agricultural research is indicated in the text of the bill itself, and the funds derived from this act are "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States. It is for the more complete endowment and maintenance of the experiment stations, presupposing the provisions of a working plant and administrative officers."

During the present year there will be received $9,000 from the Adams Fund, which sum will be increased $2,000 per year until it reaches the full amount in 1911.

The Nelson Fund.—While not directly germane to the work of the Experiment Station, the Nelson bill, passed by Congress March 4, 1907, appropriates for teaching purposes $5,000, and provides for an increase of $5,000 per year until the total appropriation shall reach $25,000 annually. This fund is designed to supplement the Morrill Act of 1862, on which the land grant colleges were founded.

These funds are given by the Federal Government to aid and stimulate the development of agriculture, and there is a moral obligation upon each state receiving the same to supplement such funds so far as is within its power.

Lands.—In accordance with the established policy of the University to expand its land holdings that are immediately contiguous to the present University Campus to an amount which has been decided upon as absolutely necessary, there have been purchased for the use of the College of Agriculture during the last year two tracts of land known as the Corry and King tracts, two and one-half acres each, immediately adjacent to the present University Farm. These lands are now surrounded on all four sides by University holdings, and it is indeed fortunate that it was possible to purchase the same before expensive buildings were erected thereon.

Buildings.—The two new buildings that have been in process of construction this last year, to be used by the departments of Agricultural Engineering and Agronomy, are now completed and occupied. They are located immediately in front of the central agricultural building and are the first buildings to front the projected avenue or plaza which is to connect the agricultural grounds with University Avenue. Both buildings are of fire-proof construction, being built of reinforced concrete and brick with tile roofs. The Agricultural Engineering building is 50 feet by 150 feet, two stories high, with a commodious basement for heavy machinery, while a large power elevator renders convenient the handling of machinery. The building cost $43,000, and with equipment, when completed, will somewhat exceed $50,000.

The Agronomy building, 48 feet by 96 feet is two stories and basement high, and costs approximately $36,000. A unique feature in this building are the corn curing rooms, in which seed corn is fire-dried. Neither of these buildings is entirely equipped at present but it is expected that this will be provided for next year.

POLICY OF THE STATION.

For a number of years it has been the policy of this Station to concentrate its energies on a limited number of lines of work and develop these as thoroughly as possible. The wisdom of this method of procedure has been amply demonstrated by the results and no radical departure is contemplated in the immediate future. With the gradual increase in Station funds, it is, of course, desirable to inaugurate investigations in those lines whose importance has been recognized, but which have not been undertaken before because of lack of funds, but in the main, the work of the Station should be deepened and enlarged rather than spread over many new lines of effort.

The work of the Station staff is so intimately bound up with the teaching work of the College that it is difficult to separate it in many ways. The same is true of what may be called the field work in the state at large. With the accession of the Adams fund, which the law provides shall be used solely for research, it will doubtless be advisable to organize and differentiate the research work of the Station more completely than has heretofore been regarded necessary.

The rapid growth of the teaching work of the College, more especially in the Long Course in Agriculture, extending throughout the college year, with an inadequate increase in staff personnel, has resulted in late years in a lessened amount of Station or research activity. Although in a number of cases members of the Station staff have voluntarily given up a large part of the regular vacation to which they were entitled in order to carry on research work, even this has not enabled the experimental work to be carried forward on a basis commensurate with its importance.

The greatly increased demand and the necessity of extension service in the way of field demonstration work to prove in the most effective manner the results of experimental inquiry, have also taken an increased amount of the time and energy of the Station force. The importance of this work no one should underestimate, but it is quite impossible for the same staff to carry on satisfactorily the teaching work both at the College and in the field, and at the same time do the best work in research. Specific provision should be made for this type of work, so that the research work, which is especially fostered by the federal funds, can be developed in the best manner. Lines requiring continuous experimental inquiry should not be subject to marked interruption by the withdrawal of men to take up other lines of work.

WORK OF THE EXPERIMENT STATION.

The main results of the experimental work of the Station reach the public through the bulletins and reports. In this summary of the work of the Station, a synopsis of each bulletin published during the fiscal year is presented. The more detailed scientific data are given in this annual report. In addition to this material, there have been accumulated considerable experimental data on research work that are not yet complete and are therefore not in form suitable for publication at present.

Animal husbandry.—The extensive feeding experiments that have been in progress for several years have been continued this past year along the same general lines as last year. Several years ago special studies were begun on the effect of medium and high protein rations on milk secretion and on the economic production of milk and butter fat. For three years a study was made on the influence of high protein content and in 1906 studies on the effect of a wider ration were begun which it is proposed to follow for a period of three years, at the conclusion of which, adequate data for a comparison will be available.

The herd record this year shows an average production per cow of 7,413 pounds of milk, 337 pounds butter fat, equivalent to 360 pounds of butter. The average value of products per cow was $80.85, while the cost of feed consumed was $36.65, leaving an average net profit of $44.20.

A number of Ayrshires have been added to the dairy herd this last year.

Work with the milking machine has been continued during the past year and it is believed that the data accumulated will be of much value from a physiological point of view, as indicating the effect of the use of the machine on the secretory functions of the cow.

The swine department has been materially strengthened this past year. The breeding quality of the herd is seen in the record sale at $1,000 of the Berkshire boar, Star Masterpiece 2d, that has been developed on the Station farm. This animal has since brought the fancy price at auction of $5,500.

Result in horse breeding have been more successful than in previous years, since the stock is kept at the Hill Farm, where more normal conditions obtain than in the present horse barn.

Professors Hart and Humphrey are engaged in studies on the effect of phosphates in the ration of young pigs. The results indicate that certain inorganic phosphates can replace the organic phosphates in feeding rations. These results are so striking in character that they need repeating before publication.

Agricultural Chemistry.—Much of the work of the staff of this department is in such close coöperation with that of the Department of Animal Husbandry that it cannot be separated from the same. Studies in animal nutrition have been maintained on the same lines as in previous years, and Professors Hart and Humphrey have inaugurated a number of experiments that will require a considerable period for completion.

In addition to the phosphate work outlined above, an important experiment is under way to determine whether equally balanced rations derived from single and mixed plant sources have the same nutritive value. Calves are being fed on exclusive corn, oat, and wheat rations, respectively, also a compounded ration of all three grains.

Professor Hart has been studying the relation of casein and fat in milk and finds a wide variation in the casein content of milks from individual cows, and further that no definite relation exists between the amount of casein and fat. The importance of this fact has been observed in the past, but from his studies, it seems likely that the function of casein production may be developed independently from that of fat secretion. The difficulty which has always attended a study of this character is in the lack of a quick method of determining the casein content of milk. Professor Hart has developed and published in this report a method that is very promising.

Agronomy.—For the past six years this department has attempted to improve the varieties of cereal grains by selective breeding. The production of this pedigreed stock has materially improved the quality as well as the yield per acre. Trials, on a limited scale as yet, show a much greater degree of uniformity in the case of this selected stock, a matter of no small importance to many of the industries using such cereal grains. For instance, in the case of barley, the pearling, also the malting industries, require a perfectly uniform quality of grain.

For the past two years the selected varieties have been widely disseminated in the State through the medium of the Agricultural Experiment Association. During this period 600 barley centers have been established, and from reports received this season it appears there are not less than 1,500,000 bushels of selected varieties of barley grown. Improvement and dissemination work of a similar character have been in progress with corn until there are now over 1,000 corn centers from which seed is distributed.

The price received for this high grade seed is often several-fold the ordinary market value (four fold in case of corn). This work, which has been carried on by Professor Moore, in the development and dissemination of seeds through the Experiment Association is of much promise to the state at large. Estimates based on returns received this year indicate that the members of the Wisconsin Experiment Association sold over $100,000 worth of seed grains.

There is no reason why Wisconsin cannot be made a great seed grain state, just as it is already a great breeding state for live stock. With the increased price of lands, small farms, frequently occupied and tilled by the owner, with the ready maintenance of soil fertility through the use of legumes, and the raising of stock, the necessity and opportunity for the growth of high grade cereal crops are apparent. No one factor would doubtless be more potent in increasing the annual agricultural income of the State.

Bacteriology.—The leading research feature of the work of this department this past year has been a study of the cellular elements found in milk and their sanitary significance. The type of cell most abundant in milk is that form of blood corpuscles which is most commonly associated with pus, and the inference has been that the presence of this type necessarily indicated a diseased condition of the milk. In many cases city boards of health have instituted quantitative standards as to the number of cells milk may contain and be regarded as wholesome. Much dissatisfaction has arisen on the part of the dairy interests, as in many cases milks have been condemned as unwholesome where no physical trouble could be found in the animal.

Our studies have been confined this year to the perfection of the technical methods of examination and the normal variation in cell content of the milks taken from animals whose clinical history has been closely watched. It has been abundantly demonstrated that the present standards in use are quite unwarranted and that a comprehensive study should be made as to the relation of these cells in health and disease before a standard is established that is of so vital concern to the milk industry.

The work in tuberculosis has been continued this year along essentially the same lines as last year, but has been materially increased in amount. Particular emphasis has been laid on the extension feature of this work to which reference is later made.

During the past winter season the Station has distributed free 12,000 doses of tuberculin and has given special direction by mail to the application of 10,740 tests. In the collection of these tests, opportunity was found to study two well marked cases of distribution of tuberculosis through infected factory skim milk. This mode of dissemination does not become operative until the disease has made considerable headway in a herd, but when a creamery supply once becomes involved, the rapidity of spread is greatly increased.

Dairy Husbandry.—Research work in cheese lines has again been actively taken up at this Station, and during this past year, in coöperation with the United States Department of Agriculture, an extended series of experiments has been instituted. In this work the departments of chemistry, dairy husbandry, and bacteriology have participated, the immediate direction being placed under Dr. J. L. Sammis, who, during the fiscal year here reported on, was connected with the federal department.

The immediate inquiry undertaken was to study the rôle of acids in the manufacture of cheddar cheese by substituting commercial acids for those biologically produced. In all about 600 experimental cheese have been made under varying conditions. The results obtained in this work have steadily improved with increased experience, and it is hoped that this variation in technical methods of manufacture will not only throw light on the nature of the chemical and physical processes involved, but may be of material practical importance.

A consideration of many of the phenomena noted in the cheese-making process from the standpoint of physical chemistry, has aided in a much better understanding of the complex problems presented.

During the last year Mr. Benkendorf and Mr. Hatch, the latter a student connected with the Wisconsin Dairy School, have developed a simple method of determining moisture in butter. This question has assumed especial importance since the passage of the National Pure Food law, which considers butter adulterated, and therefore taxable, when it contains more than sixteen per cent of water. By subjecting weighed samples of butter to a high pressure steam in an oven, the water content is quickly evaporated and the loss determined by re-weighing. The fact that no expensive glassware or chemical re-agents are required, places this invention within reach of the average creamery operator. The results of this work have been issued in bulletin 154.

Horticulture.—For the past four years special work has been carried on with tobacco in attempting to improve the quality of the plant by breeding and selection. The variety thus produced has been disseminated for the past two years, and it has been amply demonstrated that it possesses improved form of leaf and superior burning qualities. Work on curing has been continued this past year, but the results obtained are not yet ready for publication.

With potatoes, experiments on blight-resisting varieties have been made at Waupaca, also trials with home-prepared insecticides as a substitute for Paris green. This latter standard insecticide is so commonly adulterated that many growers have failed to control potato insect pests by its use. Experiments were also carried on with alcohol potatoes, concerning which considerable interest has been manifested by reason of the commercial development of denatured alcohol. The varieties tested developed well and yielded about 200 bushels per acre, which however is a low yield for these non-edible varieties.

Prof. J. G. Moore has completed his studies on certain phases of cucumber forcing which are recorded in this Annual Report.

Soils.—For the past three years this department has been carrying on at Marinette and Phillips, studies on the peaty soils of the State. Two years ago, these studies were extended to the sandy soils, Sparta being chosen as characteristic of the residual sandy deposits of the central part of the State. Another station was located at Iron River, on the newer glaciated sandy soils typical of northern Wisconsin. Stations at Superior and Ashland are located on the extremely heavy clays.

Attempts have been made to improve the fertility of these soils by the use of fertilizers, and the results so far obtained indicate that all peaty soils tested lack phosphoric acid and potash, although containing sufficient nitrogen. Lime is sometimes necessary, but not in all cases. With a moderate application of these fertilizers, the fertility of such soils may be increased so that profitable yields of suitable crops can be secured.

On the sandy soils the nitrogen problem is the most pressing and the studies so far have chiefly been with reference to the use of legumes and peat. Most of the legumes grown on new land, except the clovers, seem to require inoculation to develop luxuriantly. The use of peat, which in this region is readily available, seems very encouraging.

The problem on the clays is largely a physical one, and so far, has been confined to a study of drainage by the use of tile and improvement in tilth by proper cultivation.

Studies have been begun on the question as to whether phosphoric acid used by crops can be largely derived from the organic phosphates in humus, or from the inorganic soil phosphates. A progress report of chemical studies is presented this year, but work will be continued.

The study begun last year on the effect of continual cropping on the nitrogen content of soil, has been extended this year and results obtained verify those presented last year, which indicate that depletion in this element in the clay loams of this State is larely due to removal of crop, rather than loss by denitrification and leaching. However, this decrease of nitrogen, even in our better soils, is so marked that methods of conservation and enrichment must be kept continually in mind.

The drainage problems of the State are pressing for solution. We have large areas that could be brought under cultivation if the excess moisture could be removed. In addition to the drainage work at Superior and Ashland on the heavy red clays, a soil station has been established at Mather on peat underlaid with sand. Experiments are in progress to determine whether the excess of water in the peat cannot be removed by underdraining the sand below.

Cranberry investigations.—The work on cranberry problems at Cranmoor has been continued along the same general lines as previously reported. Emphasis, however, this year, has been placed upon insect ravages and the life history of the more destructive species studied. Spraying experiments for the control of insect pests have been unusually successful, not only with leaf insects, but the fruit worm as well. Further experience on the improved methods of drainage and sanding indicate that the damage from frost in the cranberry districts can be in large measure controlled, and the crop more economically garnered than where the old method of cultivation is followed.

RELATION OF STATION TO EXTENSION SERVICE.

To make the results of experimental research of most value to the farmer, they must be presented in such a way as not only to engage his attention, but force the conviction upon him that he cannot afford to ignore their application. This can be done most effectually by actual demonstration work in which the principles sought to be inculcated are ocularly presented to the farmer. This type of work calls for experiments and demonstrations to be made throughout the State. Such work was more or less absolutely necessary in the earlier days of the Experimental Station, in order to show the usefulness of this agent as a factor in scientific agriculture, and even now, such work is heartily welcomed by the rural communities, as there are always larger or smaller numbers that are profited thereby. However, from the research point of view of the Station proper it would be desirable to reduce this demonstration work and employ the energy expended in work of a more fundamental character. As a matter of fact, it has seemed necessary to extend the amount and nature of this field work, in view of the highly desirable results accomplished by such labor. Funds for such work as this should, of course, be supplied by the State itself, rather than taken from federal moneys. So far such funds have been supplied from the University treasury, but it would be highly desirable to have the State place this work of the most immediate practical value to its people on a basis where this service could be properly and efficiently organized, so that it would not consume so much time of the Experiment Station force. In fact, a more or less separate staff should be provided for this work, which, however, should be closely co-ordinated with the research work of the Station.

Potato spraying.—The demonstration work on potatoes, where field experiments on a large scale were made as to spraying methods, etc., has been extended this year. Tests were made at Grantsburg, Hancock, and Waupaca, and field institutes were held not only at time of spraying but during the harvesting of the crop. While the season was not especially favorable to the growth of the blight fungus, the difference in yields in all cases was very appreciable.

Tuberculosis post-mortems.—The tuberculosis demonstrations have been carried on more actively this year than any year previous. At a number of the county fairs and at the state fair, post-mortem demonstrations were held at which lectures were given which were attended by many thousand farmers, who thus saw for the first time the ravages of this insidious disease. By these ocular demonstrations a large number of farmers are induced to apply the test to their own herds.

Northern sub-stations.—The work of the northern sub-stations is largely demonstration work with reference to conditions in that part of the State. The two types of soil represented (sandy and heavy red clay) enable the Station to show the farmers the varieties of crops best adapted to their region. The work on tile drainage shows a great improvement in the physical condition of the soil, as indicated by the marked increase in the yield of crops. Mr. Delwiche, as last year, has had direct charge of the work. The College has offered the free use of a clover huller to farmers in the northern counties contiguous to the stations, in order to encourage the growth of this forage crop. This region is so well suited to the development of this plant that the production of a high-priced crop, like clover seed, would seem of much value to this region and at the same time the fertility of the lighter soils would be enhanced thereby.

Butter and cheese scoring exhibitions.—Last May the Dairy Department instituted a new line of educational work that is allied to the extension service. Butter and cheese makers are requested to send in monthly samples of their regular make which are scored independently by three judges. They are then advised as to the faults of the product, with suggestions as to remedial measures, thus giving direct aid as to methods of improvement. This series of scoring exhibitions began with 160 entries and has since increased to 230. The success of the work is attested by the fact that the participants in these exhibitions at the Wisconsin State Fair won three-fourths of all prizes in butter, and two-thirds of those in cheese. At the National Dairy Show at Chicago in October, 1907, the average score of Wisconsin exhibitors taking part in these monthly scorings was 93, while an equal number of Wisconsin exhibitors not trained in these exhibitions was 90.25. In many cases a marked improvement in quality of exhibitor's product has been noted during progress of the season. Such a method of procedure is of far more educational value than mere scoring contests.

CONTROL INSPECTION WORK.

In addition to these purely demonstrative lines of work, the Station has for years carried on more or less control inspection work that really should be included in the extension service of the State.

Feed inspection.—The law authorizing the control of feeding stuffs was materially extended by the last legislature, and is now made to include all concentrated feeds used in feeding farm animals, except single grains and mill feeds and malt sprouts, sold locally at point of production. The enforcement of this law is placed in the hands of the Station. There is no question but that this control has resulted in a marked improvement in the quality of feed sold in the State. Adulterations have been promptly exposed, thus saving consumers from considerable losses.

Fertilizer control.—The fertilizer control is slowly but steadily growing in importance. This past year 22 brands were analyzed and given a license for sale in this State. While the use of commercial fertilizers in Wisconsin has not reached anything like the importance that it has in the eastern states, doubtless the existence of our present fertilizer law has prevented the sale of many fertilizers that were not up to standard.

Official dairy tests.—The official testing of dairy cows in order to have unprejudiced records as to milk production of animals in advanced registry, is aiding in the development of higher breeding in the State. This work, as well as that relating to feed and fertilizer inspection, has been continued as in former years, under the direction of Professor Woll. The dairy tests have been developed along similar lines to those of previous years, but there is a marked tendency toward tests of longer duration than formerly, a condition which is to be welcomed, since such tests more nearly indicate the actual normal performance of the animal than weekly or monthly tests. The semi-official yearly tests, inaugurated by our Station in 1905, have become an important feature in determining the yield of dairy animals. This year witnesses the authenticated records of what promises to be the highest production of butter fat by a cow of any breed. Colantha 4th's Johanna, a Holstein cow, bred and owned by Mr. W. J. Gillette of Rosendale, has produced during the past ten months more butter fat than any other animal for an entire year, viz, approximately 1,000 pounds of butter. The yearly test of this cow will not be completed until the close of the year.

Stallion inspection service.—The legislature of 1906–1907 amended the Stallion Service law, in a bill approved June 27, 1907, which provides for a renewal license biennially. The Department of Horse Breeding is also vested with the power for refusing licenses to unsound stallions and the law stipulates the diseases which shall constitute unsoundness in public service stallions. This amended law is a material improvement over the original act, but even this will doubtless need to be adjusted to meet conditions which cannot be foreseen.

A large part of Professor Alexander's time is given to the enforcement of this law which has been found to be very beneficial to the stock interests of the State, as it has led to the retirement from service of many unsound stallions. Much educational work has also been done to encourage the use of pure bred rather than grade sires, *Nursery inspection.*—The enforcement of this law is placed in the hands of the Director of this Station, although the financial matters relating thereto are not included in the general Station budget, but are handled directly with the State Auditing Department, and all fees collected paid directly to the State Treasurer.

This work, which has been carried on by Prof. J. G. Moore, assisted by Mr. Rogers, both of the Department of Horticulture, has materially increased in the last few years, and the necessity of watchfulness is shown by the fact that for the last three years the dreaded San Jose scale has been found in the State. A number of other insect pests and fungous diseases have also been detected on nursery stock and the dissemination of such prevented by this timely examination.

Tobacco work.—For the past two seasons a considerable quantity of high grade tobacco seed, bred and improved by this Station, has been distributed free throughout the tobacco districts of the State. Demonstration tests on the use of fertilizer for tobacco have been carried on at Janesville.

Prospective work in seed control.—The legislature at its last session (1906–1907) passed an act requiring the Station to test all vegetable, forage, and cereal seeds as to adulterations, but failed to make any financial provision therefor. The necessity of such a department of seed control is unquestionably urgent and the Station has for some years been doing considerable work in this direction, especially with reference to forage and cereal crops. This work would prove valuable in the detection, not only of adulterations, but of the lack of viability of seeds, which causes much loss in some seasons. Before such an act can be placed on a helpful basis, it will be necessary to have specific funds set apart for such purpose.

COÖPERATIVE WORK WITH THE UNITED STATES DEPARTMENT OF AGRICULTURE.

For several years this Station has maintained coöperative relations with the United States Department of Agriculture in various lines of work. The investigations carried on during this past year have been relative to the manufacture of cheddar cheese, and the breeding of feeding and brewing barleys, subjects which will also be continued during the forthcoming year.

During the fiscal year here reported, Dr. J. L. Sammis and Mr. J. W. Moore have represented the Dairy Department of the United States Department of Agriculture, and have been in residence at the Station, in coöperative work carried on with our departments of dairying, agricultural chemistry, and bacteriology. Reference to this work has previously been made under the head of "Dairy Husbandry".

For the past six years coöperative work between the Department of Agronomy of this Station and the Bureau of Plant Industry of the Department of Agriculture has been conducted in the testing of choice grains and forage plants. The further improvement of pedigreed barleys has been continued during the past year, with a view of acclimating the same to this State, and also of ascertaining from actual brewing tests, whether these barleys are superior to those ordinarily employed in the brewing industry. In this work Prof. R. A. Moore has acted as collaborator for the government, and has had an assistant of the Bureau of Plant Industry to help him in the dissemination of the pedigreed varieties that have been tested in practically all the barley-growing regions of the United States. Considerable analytical work has been performed by Professor Woll and Mr. Olson in coöperation with the Association of Official Agricultural Chemists under the auspices of the federal department of agriculture.

COÖPERATIVE WORK WITH STATE ORGANIZATIONS.

The Department of Bacteriology has continued its coöperative work with the State Live Stock Sanitary Board in its effort to eradicate tuberculosis from the State. The Station has also carried on considerable work with the State Dairy and Food Commission in studying problems which have arisen in the field and which demand the necessity of careful laboratory supervision. In this way opportunities are frequently furnished for the study of abnormal conditions of interest.

The cranberry work has been materially aided by the close cooperation of the Wisconsin Cranberry Growers' Association. Coöperation with individuals has been put into operation in a number of different lines. No difficulty is experienced in securing all the aid necesary to carry on this work, as the more intelligent farmers appreciate the fact that only through experimental inquiry will our methods be improved over existing practice.

PUBLICATIONS.

List of bulletins published from June, 1906 to June, 1907.

No.	Title.	Author.	Size of edition	Number of pages.
138	Land drainage	Whitson and Jones	22,000	40
139	Principles and maintenance of soil fertility	Whitson and Stoddard	25,000	28
140	Development of factory dairying in Wisconsin, with wall map	Russell and Baer	5,000	28
141	A report on horse-breeding industry of Wisconsin	Alexander	25,000	162
142	Licensed commercial feeding stuffs, 1906	Woll and Olson	20,000	54
143	The spread of tuberculosis through factory skim milk, with suggestions as to its control	Russell	25,000	28
144	Official tests of dairy cows	Woll and Harris	20,000	63
145	The relative value of shelled corn and corn meal for fattening pigs	Henry and Otis	25,000	16
146	Drainage conditions in Wisconsin	Whitson and Jones	20,000	47
147	Report on northern sub-stations for 1906	Delwiche	25,000	48
148	The pasteurization and the inspection of creamery and cheese factory by-products	Farrington and Hastings	10,000	17
149	Licensed commercial fertilizers and feeding stuffs, 1907	Woll and Olson	20,000	32
150	Sugar beet experiments during 1906	Woll and Stoddard	20.000	45
151	Condimental stock foods	Woll	50,000	40
152	A comparison of aniline and anatto butter colors in butter making	Farrington and Meyers	10,000	19
	Twenty-third annual report		15,000	321

Bulletin 138. Land drainage.—This bulletin contains practical directions for the drainage of land, chiefly by the use of tile. The details presented are based largely upon experience gained in southeastern Wisconsin and on the red clay soils in the Lake Superior region. An outline of the law regarding the organization of drainage districts is given as a guide to farmers.

Bulletin 139. Principles and maintenance of soil fertility.—A discussion is given of the conditions which influence fertility, such as the amount and form of organic, as well as inorganic matter. In this publication attention is especially directed to the fact that acid soils are deficient in available phosphates, so that the presence of acidity, as shown by the litmus test is a positive indication that the soil requires phosphates either by the addition of commercial fertilizers or manure. The use of fertilizers on the various classes of Wisconsin soils is also discussed.

Bulletin 140. Development of factory dairying in Wisconsin.—This bulletin contains a map showing location of cheese factories and creameries on January 1, 1907.

The bulletin was prepared in coöperation with the Wisconsin Dairy and Food Commission, and is the third of a series of dairy maps published at five-year intervals, in which there is recorded the exact location of each cheese factory, creamery, and skimming station in the State. The total number of dairy factories, including all kinds, is 2,969, of which 1,649 are cheese factories, 1,017 creameries, 40 combined factories, 260 skimming stations, and 3 condensaries. Since the publication of the preceding map in 1900, the number of cheese factories has increased by 118, skimming stations 199, while there are 56 less creameries and 30 less combined factories. The bulletin also presents comparative data showing the regions of active factory growth. It is noteworthy that the dairy industry, both in butter and cheese, is extending rapidly in the north central portion of the State.

Bulletin 141. A Report on the horse-breeding industry of Wisconsin.—Notes and comments are given on existing stallion service law; advice on soundnes of breeding stock; improved methods of breeding for high grades, quality, etc.; an alphabetical list or directory of owners of 1,067 licensed pure-bred stallions, and 1,561 licensed grade stallions. Statistics relative to number and breed of stallions, by counties, are also presented, as well as a list of Government approved stud books.

Bulletin 142. Licensed commercial feeding stuffs, 1906.—This bulletin contains a list of all the feeds licensed for the year 1906, with a report on the number and kind of samples collected, together with results of the analyses of the same.

The composition of the various classes of feed stuffs is discussed and also the market conditions and causes of variations and deficiencies in composition.

Bulletin 143. The spread of tuberculosis through factory skim milk with suggestions as to its control.—With the gradual introduction of tuberculosis by purchase of incipiently affected animals, disease areas are becoming established, and this bulletin records a very striking case of a region which became badly infected through the medium of factory skim milk. In two creameries over one-third and one-quarter, respectively, of all animals tested reacted to the tuberculin test, and in a great majority of cases young stock were found severely affected. A large number of other tests made in contiguous creameries show less than ten per cent of such infection. Methods for control are suggested, such as the use of hand separators and the pasteurization of skim milk.

Bulletin 144. Official tests of dairy cows, 1905—1906.—This bulletin gives a detailed report of the work of supervising the test records of Holstein, Guernsey, and Jersey cattle in this State, with photographs of a number of the best producers. The rules and regulations regarding the conduct of such tests, made under the auspices of the Experiment Station, are also included.

Bulletin 145. The relative value of shelled corn and corn meal for fattening pigs.—Results of experiments for the past ten years in which a comparison was made between the above mentioned feeds are given. It shows that when corn is worth 25 cents per bushel, the saving from grinding is not enough to cover its cost unless cheap power is available. With every five cents advance in price, the saving per bushel by grinding increases three-tenths of a cent, making the saving by grinding four and a half cents, with corn at 75 cents per bushel.

Bulletin 146. Drainage conditions of Wisconsin.—This bulletin discusses the agricultural value and the probable increase in value by drainage of the marsh lands, as well as the wet clay lands of the State. Considerable field work was done in Racine, Walworth, and Outagamie counties. It is pointed out that the drainage of these types of land at an expense of approximately $65,000,000 can reasonably be expected to increase the value of such lands at least $100,000,000 above the cost of drainage. There are approximately 2,500,000 acres of marsh lands in Wisconsin requiring drainage and probably 5,000,000 acres of clay lands which would be much benefited by tile drainage.

Bulletin 147. Report on the northern sub-stations for 1906.—The northern sub-stations are located upon the heavy red Lake Superior clays and the light sandy soils in the northern portion of the State. The three stations already established are located at Ashland, Iron River, and Superior. Experimental work on field crops of all kinds and in horticulture has been undertaken.

Bulletin 148. The pasteurization and the inspection of creamery and cheese factory by-products.—This bulletin is supplementary to bulletin No. 143 as indicating the practical ways in which disease germs may be destroyed in skim milk. Inexpensive pasteurizing devices are described which may readily be installed by the creamery operator. Methods are described, more particularly Storch's test, which is in general use in Denmark, by which it can readily be determined whether factory by-products have been heated to the required temperature to destroy disease germs.

Bulletin 149. Licensed commercial fertilizers and feeding stuffs, 1907.—The bulletin presents in popular form the nature and origin of common fertilizing ingredients, with suggestions as to purchase and use with analysis of brands of commercial fertilizers licensed during the year. Results of the analyses of samples collected during 1906 are also given, together with a list of licensed feeds for 1907 and the text of the feed and fertilizer laws now in force.

Bulletin 150. Sugar beet experiments during 1906.—The work on sugar beets during this year was confined mainly to a study of the adaptability of Grant and Vernon county soils to sugar beet culture, also to experimental work on methods of fertilization. Experiments were conducted on ten different farms. The results showed that beets of a rich sugar content and high purity could be raised in southwestern Wisconsin on the unglaciated soils. With regard to fertilizer requirements, in all cases but one, a complete fertilizer of nitrate, phosphate, and potash gave the best returns, both in yield of beets and of sugar. Lime was beneficial on six of the ten plots.

Bulletin 151. Condimental stock foods.—This bulletin gives the chemical analyses of thirty samples of stock foods collected in the open market by the Station. It also discusses the claims of manufacturers of stock foods as set forth in advertising matter, with results of twenty-three actual feeding trials with different classes of farm stock conducted at more than a dozen different experiment stations. The medicinal effects of stock foods are shown to be questionable, since the prescribed doses of the various drug ingredients are from five to ten times greater than the quantity recommended in feeding. Many worthless ingredients were found, and in most cases the prices charged were grossly exorbitant. According to statistics collected in three counties amounts aggregating in cost $11,200 were sold during the year. On this basis the sales in Wisconsin are estimated to be approximately $300,000 annually.

Bulletin 152. A comparison of aniline and anatto butter colors in butter making.—In view of the fact that the National Pure Food Law discountenanced the use of aniline butter color, experiments were undertaken to show (1) whether the vegetable butter colors now on the market imparted an objectionable flavor to the butter, and (2) whether butter colored with vegetable color would hold its color when kept in cold storage. The conclusions reached are that butter can be satisfactorily colored by use of a vegetable color, even when stored at low temperature; that certain vegetable colors impart a decided flavor to the butter, which, however, becomes less noticeable with age. This leads to the conclusion that it is possible in time for the manufacturers of these colors to produce an article which will be less objectionable.

OBSERVATIONS ON SHEEP BREEDING FROM RECORDS OF THE UNIVERSITY FLOCK.*

GEO. C. HUMPHREY AND FRANK KLEINHEINZ.

INTRODUCTION.

Records, which have been kept of the University flock since 1900, furnish data pertaining to breed, age and weight of ewes and rams, date of service and lambing of ewes, number, weight, sex and condition of lambs at birth, and the milking qualities of the ewes. Bulletin No. 95 of this Station, by Prof. W. L. Carlyle and Prof. T. F. McConnell, gives observations on sheep breeding from these records and covers a period of twelve years, ending with 1902. The records for the five subsequent years form the basis of this article and the data presented will be found comparable with those given in Bulletin No. 95.

Observations have been made and data given on the following subjects:—

Period of gestation.

Size, condition, and sex of lambs as affected by the period of gestation.

Condition of lambs of various breeds at birth.

Per cent of single, twin, and triplet lambs from ewes of the different breeds.

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* The data presented in this article were used by Messrs. Raitt and Rosenthal for thesis submitted in June, 1907, for the Degree of Bachelor of Science in Agriculture. To them much credit is due for assistance in this work.

Comparative weights and condition at birth of single, twin, and triplet lambs of the various breeds.

Per cent of increase of lambs from ewes of the various breeds.

Effect of age of ewes and rams on per cent of increase and on sex of lambs.

Influence of weight of ewes and rams on number and size of lambs.

Influence of sex on weights of lambs.

PERIOD OF GESTATION.

It is the custom at the Wisconsin Experiment Station to keep the rams separate from the flock and only for a short period each morning and evening during the mating season are they allowed to run with the flock. The shepherd or his assistant carefully notes and records which ewes are bred each day. Taking 147 days as the period of gestation, the time of lambing is entered in the record book and thus the shepherd has no difficulty in determining when a ewe is due to lamb.

Authorities differ on the duration of the period of gestation or pregnancy of ewes, but all American authorities place it within the limits of 140 to 155 days. Tassier, the French authority, gives the results of observations on 912 ewes, extending over a period of forty years, in which the period of gestation varied from 146 days as the shortest to 161 days as the longest period that a ewe carried her lamb. The average, according to this authority, is 152 days. Breeding charts issued by breeders' associations and agricultural papers recognize 147 days as the period of gestation. Wisconsin Bulletin No. 95 gives the extreme periods of gestation as being 140 to 156 days, with the greatest number of ewes lambing on the 146th day.

In the accompanying table the period ranges from 142 to 155 days, the greatest number of ewes, fifty-five, or 22.9 per cent dropping their lambs on the 147th day. One hundred and twenty ewes, or 50 per cent, dropped their lambs within one day of the stated period, while 179, or about 75 per cent, dropped their lambs within two days of the given period. The number of ewes that carried their lambs more than 147 days after service was greater than the number of ewes that dropped their lambs earlier.

It has been claimed that the breeds which mature early have a shorter gestation period and *vice versa.* This fact is brought out in Wisconsin Bulletin No. 95 and agrees with the results of Tassier, as his observations were made entirely on the slow maturing Merino breed.

TABLE I.—*Length of gestation period of ewes of different breeds and crosses.*

Days of gestation.	142	143	144	145	146	147	148	149	150	151	152	153	154	155	Total number of ewes.
Shropshire	....	3	9	15	18	25	14	6	5	4	1	3	1	....	104
Shropshire Merino	1	....	1	3	5	9	1	5	3	..	....	....	....	....	28
Southdown	1	3	....	5	5	13	7	9	1	3	1	....	....	....	48
Dorset	....	1	....	....	....	4	3	2	2	2	....	2	....	..	16
Oxford	1	....	....	2	1	1	....	1	....	....	1	1	....	....	8
Hampshire	....	....	1	5	2	2	1	2	1	....	....	....	....	....	14
Montana	1	....	....	....	8	....	2	...	...	1	....	1	....	....	8
Cheviot	....	....	..	1	2	1	1	3	1	2	2	....	...	1	14
Total number of ewes.	4	7	11	31	36	55	29	28	13	12	5	7	1	1	240
Total per cent	1.7	2.9	4.6	12.9	15.0	22.9	12.1	11.7	5.4	4.2	2.1	2.9	.4	.4	100

EFFECT OF GESTATION PERIOD ON SIZE OF LAMBS.

Soon after birth the lambs have always been weighed and arbitrarily placed in one of three classes, viz, small, medium, or large. The small group comprises lambs weighing less than eight pounds, the medium group between eight and ten pounds, and the large group includes all above ten pounds, It will be noticed in the following table that the largest number of lambs were small. It will be seen that out of a total of 202 small lambs, 123, or 61 per cent were dropped on or before the 147th day, and 79, or 39 per cent after the 147th day. Of the medium group, out of a total of 151 lambs, 93 or 61.6 per cent were dropped on or before the 147th day, and 58 or 38.4 per cent thereafter. Out of a total of

44 in the large group, 27, or 61 per cent were dropped on or before the 147th day, and 17, or 39 per cent were dropped later. From this it would appear that the number of days a lamb is carried *in utero* does not affect its size at birth.

TABLE II.—*Number and per cent of small, medium, and large lambs for each period of gestation.**

Days of gestation.	142	143	144	145	146	147	148	149	150	151	152	153	154	155	Total.	Dropped on or before the 147th day.	Dropped after the 147th day.
Small	4	6	10	33	30	40	27	22	8	11	6	4	1	....	202	123	79
Medium	2	4	11	14	25	37	20	16	6	4	4	7	....	1	151	93	58
Large	1	....	....	4	8	14	4	5	5	1	1	1	....	..	44	27	17
Per cent small	57.1	60	47.6	61.7	47.6	43.9	52.9	51.2	42.1	68.7	54.6	33.3	100	....	50.9	61.0	39.0
Per ct medium	28.6	40	52.4	27.5	39.7	40.6	39.2	37.2	31.6	25.0	36.4	58.3	....	100	38.0	61.6	38.4
Per cent large.	14.3	...	....	7.8	12.7	15.5	7.9	11.6	26.3	6.3	9.0	8.4	....		11.1	61.0	39.0

*Small—under 8 pounds.
Medium—8 to 10 pounds.
Large—over 10 pounds.

CONDITION OF LAMBS WITH REFERENCE TO THE PERIOD OF GESTATION.

There is no known method by which the period of gestation can be controlled, but Table III shows that if there were such a method known, it would be better to have the lambs dropped on or a few days before the 147th day after service, rather than later. Wisconsin Bulletin No. 95 shows that the greater number of strong lambs were born between 144 and 149 days after service. Table III of this article shows that 90 per cent of the lambs born on or before the 147th day after service were strong, while only about 55 per cent of those dropped later were of this character Of the total number of lambs born on the 149th day, 18 per cent were still born. Too much importance should not be placed on the per cent of strong lambs born on the extreme limits of the gestation period, since only a small number of lambs were dropped for these periods.

TABLE III.—*Number and condition of lambs at birth for various gestation periods.*

Days of gestation.	142	143	144	145	146	147	148	149	150	151	152	153	154	155	Born on or before the 147th day.	Born after the 147th day.
Number of lambs..	7	10	21	51	63	91	51	43	19	16	11	12	1	1	243	154
Number dead......	....	....	1	1	....	4	3	8	1	1	2	....	....	....	6	15
Per cent dead.. ...	....	....	4.7	1.9	....	4.4	5.9	18.6	5.2	6.3	18.1	....	....	....	2.5	9.7
Number weak......	....	....	....	2	3	10	20	12	6	7	3	6	....	....	15	54
Per cent weak......	....	....	...	3.9	4.8	10.9	39.2	27.9	31.6	43.7	27.2	50	....	....	6.2	34.4
Number weak and dead	....	....	1	3	3	14	23	20	7	8	5	6	....	....	21	69
Per cent weak and dead.............	....	....	4.7	5.8	4.8	15.3	45.1	46.5	36.8	50	45.3	50	....	....	8.7	44.1
Number strong....	7	10	20	48	60	77	28	23	12	8	6	6	1	1	222	85
Per cent strong....	100	100	95.3	94.2	95.2	84.7	54.9	53.5	63.2	50	54.7	50	100	100	91.3	55.9

GESTATION PERIOD AND THE PERCENTAGE OF MALE AND FEMALE LAMBS.

It is claimed by many stockmen that the period of gestation in all classes of stock is longer for a male than for a female. Wisconsin Bulletin No. 95 shows no foundation for this theory. Table IV, however, indicates that the males were carried longer *in utero* than the females. The difference, however, is very slight, and with the small number of lambs recorded it cannot be taken as conclusive evidence. It is interesting to note that out of 397 lambs, 206, or 51.8 per cent were males and 191, or 48.2 per cent were females. During the period of seventeen years that these records have been kept, there were 1,218 lambs born; of these 616, or 50.5 per cent were males and 602, or 49.5 per cent were females, showing that nature does her own selection of sex.

TABLE IV.—*The relation of the gestation period to the number of male and female lambs.*

Days of gestation.	142	143	144	145	146	147	148	149	150	151	152	153	154	155	Total.
Males.	3	5	12	19	26	55	28	22	13	9	4	10	....	....	....
Females	4	5	9	32	37	36	23	21	6	7	7	2	1	1	....
Per cent males	42.8	50	57.1	37.3	41.3	60.4	54.9	51.1	68.3	56.2	36.4	83.3	....	....	51.8
Per cent females	57.2	50	42.9	62.7	58.7	39.6	45.1	48.9	31.7	43.8	63.6	16.7	100	100	48.2

CONDITION OF LAMBS OF VARIOUS BREEDS AT BIRTH.

The data on this subject show a remarkably large number of strong lambs for all breeds ranging from 68.3 per cent to 93.2 per cent. As the following table shows, the Cheviots are the strongest, the Shrop-Merino, Southdown, Hampshire, Dorset, Montana, Shropshire, and Oxford following in the order named. The Oxfords show the highest percentage of dead lambs, which is two and one-half times that of any other breed. This table is important as it gives the breeder some insight as to which breed will drop the largest per cent of strong lambs.

TABLE V.—*Condition of lambs of various breeds at birth.*

BREED.	STRONG LAMBS.		WEAK LAMBS.		DEAD LAMBS.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Shropshire	125	70.62	39	22.03	13	7.35
Dorset	23	76.66	3	10.00	4	13.34
Shrop-Merino	43	86.00	7	14.00	....	....
Southdown	61	85.92	5	7.04	5	7.04
Oxford	15	68.03	3	13.60	4	18.10
Montana	12	75.00	4	25.00	....	....
Hampshire	23	79.30	4	13.80	2	6.90
Cheviot	27	93.20	1	3.40	1	3.40
Total in per cent	....	77.60	....	15.60	....	6.80

PER CENT OF SINGLE, TWIN, AND TRIPLET LAMBS FROM EWES OF THE DIFFERENT BREEDS.

It will be seen from the following table that the greatest per cent of increase is by far the result of twins, they being two-thirds of the total number of lambs. It is somewhat surprising to note that there is little difference in the per cent of twins dropped by the various breeds. Of the breeds which produced triplets, 55 per cent were dropped by ewes of Shropshire breeding.

TABLE VI.—*Per cent of single, twin, and triplet lambs from ewes of the different breeds.*

BREED.	SINGLES.		TWINS.		TRIPLETS.	
	Number.	Per cent.	Number.	Per cent.	Number	Per cent.
Shropshire	42	23.7	120	67.8	15	9.5
Dorset	10	33.3	20	66.7	....	.....
Shrop-Merino	8	16.0	36	72.0	6	12.0
Southdown	27	38.0	44	62.0	....	....
Oxford	3	13.6	16	72.8	3	13.6
Montana	1	6.2	12	75.0	3	18.8
Hampshire	9	31.0	20	69.0	....	....
Cheviot	9	31.0	20	69.0	....	....
Total per cent	....	23.3	....	67.9	....	8.8

COMPARATIVE WEIGHTS AT BIRTH OF SINGLE, TWIN, AND TRIPLET LAMBS OF THE VARIOUS BREEDS.

As might be supposed, the single lambs at birth were much larger than the twins, and the twins larger than the triplets. The difference between the average weights of single and twin lambs is two and one-half pounds, the difference between the average of the twins and triplets, one and one-tenth pounds. In the case of single lambs the birth weight varied according to the breed, while in the case of twin and triplet lambs the birth weight was practically the same for all breeds. It might also be supposed that the largest lambs should also be the strongest lambs, but it appears that the condition of the ewe rather than the weight of the lamb determines the vitality and strength of the lamb.

TABLE VII.—*The comparative average weights at birth of single twin, and triplet lambs of the various breeds.*

Lambs.	Singles.	Twins.	Triplets.
	Lbs.	Lbs.	Lbs.
Shropshire	8.93	7.44	5.78
Dorset	10.7	8.53	
Shrop-Merino	10.41	8.25	7.76
Southdown	8.53	7.41	
Oxford	10.42	8.18	7.12
Montana	7.95	7.32	6.54
Hampshire	10.25	8.37	
Cheviot	8.81	8.18	
Average for all breeds	9.50	7.96	6.80

COMPARISON OF THE CONDITION OF SINGLE, TWIN, AND TRIPLET LAMBS OF THE VARIOUS BREEDS.

In gathering the data for this table, all lambs still born were recorded as dead, those weak at birth were recorded as weak even though they died a few hours afterwards, and all others were recorded as strong. With these conditions in mind we notice that two breeds, the Dorset and Cheviot, dropped 100 per cent of strong single lambs, while the Oxford dropped only 33 per cent, and the Montana none. We notice also that the Shropshire and Oxford breeds had a large per cent of weak and dead lambs. These breeds also had the greatest per cent of twins and triplets. From this it is apparent that the vitality of the lambs is affected by the increased production of twins and triplets. Taking the flock as a whole, the per cent of weak lambs increases from single lambs to triplets in the ratio of one to four, and in the case of dead singles and dead triplets the ratio is three to one. The per cent of strong singles and twins is about the same, but the per cent of strong triplets is comparatively low.

TABLE VIII.—*A comparison of the condition of single, twin, and triplet lambs of the various breeds.*

BREED.	SHROPSHIRE.		DORSET.		SHROP-MERINO.		SOUTHDOWN.		OXFORD.		MONTANA.		HAMPSHIRE.		CHEVIOT.		Total. Per cent.
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	
Strong singles	31	73.9	10	100	7	87.5	21	77.8	1	33 3	......	....	6	66.7	9	100.0	77.9
Strong twins	88	75.0	13	65.0	30	83.4	40	90.9	11	68.8	12	100.0	17	85.0	18	90.0	78.6
Strong triplets	6	40.0	......	....	6	100.0	......	....	3	100.0	......	....	......	....	......	....	57.7
Weak singles	4	9.3	......	....	1	12.5	2	7.4	2	66.7	1	100.0	1	11.1	......	....	10.0
Weak twins	2[illegible]	23.3	3	15.0	6	16.6	3	6.8	1	6.2	......	....	3	15.0	1	5.0	14.7
Weak triplets	7	46.6	......	....	......	....	......	....	......	....	3	100	......	....	......	....	38.4
Dead singles	7	16.6	......	....	......	....	4	14.8	......	....	......	....	2	22.2	......	....	12.1
Dead twins	5	1.7	4	20.0	......	....	1	2.3	4	25.0	......	....	......	....	1	5.0	6.7
Dead triplets	2	13.4	......	....	......	....	......	....	......	....	......	....	......	....	......	....	3.9

Summary of the number, per cent, and weight of lambs from all the ewes of the University flock for different years.

	Ewes.	Lambs.	Per cent of increase.	Average weight, pounds.
1903	52	83	160	8.3
1904	53	94	177.3	8.2
1905	51	71	140.	8.8
1906	54	89	161.8	8.3
1907	49	82	167.3	8.3
Total and average	259	419	161.7	8.3

PER CENT OF INCREASE OF LAMBS FROM EWES OF THE VARIOUS BREEDS.

The data in the following table are the most important to the practical breeder as they show which breed will yield the largest per cent of increase. They also show that one must not expect the same per cent of increase each year. The average for the five years shows that the most prolific breed is the Montana, the Oxford next, and the Shropshire third. Omitting the Montana for which there were records for only two years and the Oxford for which there were only a few representatives, the Shropshire ranks first with an increase of 166 per cent. Taking the flock as a whole, the per cent of increase for the different years varied from 140 per cent to 177.3 per cent. As to the cause of this difference, it has been suggested that it might be due to the condition of the ram and the ewe at the time of mating. The per cent of increase of each breed, in a large measure, controls the average weight of the lambs, since the lowest per cent of increase is accompanied by the largest average weight of lambs, and *vice versa.* There is one exception, however, that of the Southdown, which is a small breed and has a low per cent of increase and a low average weight of lambs produced.

TABLE IX.—*Number, per cent of increase, and weight of lambs from ewes of the various breeds.*

BREEDS.	SHROPSHIRE.				DORSET.				SHROP-MERINO.				SOUTHDOWN.			
	Ewes.	Lambs	Per cent increase.	Weight in pounds.	Ewes.	Lambs.	Per cent increase.	Weight in pounds.	Ewes.	Lambs,	Per cent increase.	Weight in pounds.	Ewes.	Lambs.	Per cent increase.	Weight in pounds.
1903...........	16	26	162	7.5	5	8	160	9.1	12	19	153	8.8	7	10	143	7.9
1904...........	14	25	178	7.9	5	8	160	8.9	13	26	200	7.7	9	13	153	7.4
1905...........	25	35	140	8.3	4	5	125	10.0	3	5	166	9.4	10	14	140	8.1
1906...........	28	48	171	7.7	2	4	200	8.8	....	....	....	....	12	18	150	7.9
1907...........	22	40	182	7.2	3	8	100	9.8	....	....	....	....	11	16	145	8.1
Totals and averages.	105	174	966	7.7	19	28	149	9.3	28	50	141	8.6	49	71	142	7.9

BREEDS.	OXFORD.				MONTANA.				HAMPSHIRE.				CHEVIOT.			
	Ewes.	Lambs.	Per cent increase.	Weight in pounds	Ewes.	Lambs.	Per cent increase.	Weight in pounds.	Ewes.	Lambs.	Per cent increase.	Weight in pounds.	Ewes.	Lambs.	Per cent increase.	Weight in pounds.
1903...........	4	6	150	8.2	4	9	225	6.6	2	3	150	9.3	2	2	100	9.1
1904...........	3	7	223	8.0	4	7	175	7.6	2	3	150	9.8	2	3	150	8.8
1905...........	2	3	150	9.1	....	....	....	....	5	6	120	9.1	2	3	150	7.8
1906...........	1	2	200	8.8	....	....	....	....	5	7	140	8.4	6	10	166	8.2
1907...........	2	4	200	7.8	....	....	....	....	5	10	200	8.8	6	9	150	8.2
Totals and averages..	12	22	186	7.8	8	16	200	7.1	19	29	152	9.1	18	27	152	8.4

EFFECT OF AGE OF EWE ON PER CENT OF INCREASE AND O SEX OF LAMBS.

Table X shows that ewes increase in the production of lamb for different years from 141 per cent at two years old to 19 per cent at six years old. At eight years old the increase i 100 per cent, and at nine years 200 per cent. There wer only two ewes nine years old, however, and their producin twins at this age was somewhat exceptional. It will be noticed in the following table that the number of ewes producin single lambs decreases with age up to seven years and then increases, while with ewes producing twin and triplet lambs thi is just the reverse. There is also a gradual increase in the per cent of ewes which produce ram lambs as the age of the ewe advances. The total number of ram and ewe lambs produced, however, are very evenly balanced, there being 51.1 per cent of rams and 48.9 per cent of ewes.

TABLE X.—*Effect of age of ewes on per cent of increase and on sex of lambs.*

AGE OF EWES.	EWES PRODUCING LAMBS.										Increase in per cent.
	Singles.		Twins.		Triplets.		Rams.		Ewes.		
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent	Number.	Per cent.	Number.	Per cent.	
2 years........	24	58.5	29	41.5	......	.....	47	47.4	52	52.6	141
3 years........	24	46.1	27	51.9	1	2.0	36	44.4	45	55.6	156
4 years........	16	30.7	35	67.3	1	2.0	48	53.9	41	46.1	171
5 years........	12	32.4	23	62.1	2	5.5	33	51.5	31	48.5	173
6 years........	6	25.0	14	58.3	4	16.7	26	56.5	20	43.5	192
7 years........	6	54.5	5	45.5	......	......	10	62.5	6	37.5	145
8 years........	2	100	......	......	......	......	1	50.0	1	50.0	100
9 years........	......	.....	2	100	......	......	4	100	......	......	200

Total number of lambs: rams 205; 51.1 per cent; ewes 196; 48.9 per cent.

EFFECT OF AGE OF RAM ON PER CENT OF INCREASE AND SEX OF LAMBS.

In the conclusions drawn from the following table, the lamb ram has been discarded for the reason that he was used but five times. According to the common opinion held by sheepmen, a ram is at his best as a yearling. Table XI and also the conclusions given in Wisconsin Bulletin No. 95, show that the yearling ram, instead of producing the greatest per cent of increase, produces the least, and that a ram is at his best at two and three years of age. We also find that the age of the ram does not seem to have any effect on the sex of the lambs.

TABLE XI.—*Effect of age of ram on per cent of increase and on sex of lamb.*

AGE OF RAMS.	RAMS GETTING LAMBS.										Increase in per cent.
	Singles.		Twins.		Triplets.		Rams.		Ewes.		
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	
Lamb	......	......	10	100	......	......	5	50.0	5	50.0	200
1 year	11	51.4	10	47.6	......	......	12	57.1	9	42.9	171
2 years	19	19.5	62	73.1	9	7.4	55	61.1	35	38.9	164
3 years	35	23.9	106	69.1	12	6.6	75	50.0	75	50.0	166
4 years	35	29.4	78	65.4	6	5.2	56	46.5	63	53.5	156
Over 4 years.	3	33.0	6	67.0	......	......	5	55.5	4	44.5	150

INFLUENCE OF SEX ON WEIGHT OF LAMBS.

Observations on the entire number of lambs for five years show that the average weight at birth is 8.1 pounds. The average weight of the ram lambs is 8.3 pounds, and that of the ewe lambs 7.8 pounds, a difference of one-half pound in the birth weight of the lambs in favor of the rams.

INFLUENCE OF WEIGHT OF EWE AND RAM ON NUMBER AND SIZE OF LAMBS.

In considering the influence of the weight of the ewes and the rams on the weight of the lambs, it was found necessary to divide them arbitrarily into three classes, small, medium, and large. All ewes below 125 pounds were considered small, those between 125 and 150 pounds medium, and all above 150 pounds large. The rams below 175 pounds were small, those between 175 and 210 pounds medium, and all over 210 pounds large. The lambs were divided as in Table II. The percentages of single, twin, and triplet lambs are stated in order to allow for the effect the difference in per cent of increase would have on size.

This table shows that the larger the ewes the greater the per cent of increase. The small ewes produce the greatest per cent of single lambs, while with the medium ewes the percentage of single and twin lambs is about the same. The per cent of large ewes producing twin lambs is twice as great as the per cent from small ewes producing single lambs. While a great many conditions, such as age and breed, should be taken into consideration in estimating the increase, yet with the large number of ewes represented, the above conclusion seems justifiable.

It cannot be said that the above statement is true of the rams. There is so little difference in the per cent of increase of lambs by different rams that no conclusion can be drawn, unless it be that the weight of the ram has no effect on the number of the offspring.

As a rule, single lambs are larger than either twins or triplets, but Table XII shows that this is not always the case, especially with small ewes. From Table XII it may be seen that small ewes have a tendency to produce small singles, medium ewes medium singles, and large ewes large singles. As to the twins and triplets, the majority are naturally small; however, nearly 50 per cent of the twins of the large ewes are of medium size.

Relative to the rams, the percentages of small, medium, and large lambs are so nearly alike that it seems the rams have no influence on the lambs, so far as weight is concerned.

LE XII.—*Effect of weight of ewe and ram on the number and size of lambs.*

LAMBS.*	SMALL EWES.						MEDIUM EWES.						LARGE EWES.					
	Singles.		Twins.		Triplets		Singles.		Twins.		Triplets		Singles.		Twins.		Triplets	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
l	17	38	22	49	6	13	49	30	106	65	9	5	35	19	140	75	12	6
l.	8	47	14	63	6	100	15	30	68	65	8	88	6	17	67	48	11	91
um	6	35	8	37	....	....	24	49	37	35	1	12	15	43	63	45	1	9
e	3	18	....	....	....	...	10	21	....	....	...	..	14	40	10	7	....	....

RAMS.	SMALL RAMS.						MEDIUM RAMS.						LARGE RAMS.					
	Singles.		Twins.		Triplets		Singles.		Twins.		Triplets.		Singles.		Twins.		Triplets	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
l	11	18	46	73	6	9	44	32	90	66	3	2	48	22	134	69	18	9
ll	3	28	21	46	6	100	10	23	47	52	2	66	13	30	80	60	17	95
ium	6	54	24	52	....	....	20	45	38	42	1	34	15	35	48	36	1	5
ge	2	18	1	2	....	....	14	32	5	6	....	....	15	35	6	4	....	....

nall ewes—under 125 lbs., rams—under 175 lbs., lambs—under 8 lbs.
dium ewes—125 to 150 lbs., rams—175 to 210 lbs., lambs—8 to 10 lbs.
arge ewes—over 150 lbs., rams—over 210 lbs., lambs—over 10 lbs.

SUMMARY.

From the breeding record of 240 ewes covering a period of five years the following conclusions may be drawn:—

The normal period of gestation, or the time from which a normal ewe is bred to the time of lambing, ranges from 145 to 151 days, and the greatest per cent of ewes will lamb 147 days after service.

The gestation period appears to be somewhat longer for the male than for the female.

The per cent of males born is practically the same as that of females.

The larger per cent of lambs born on or before the 147th day of pregnancy is strong, and after this time the number of weak and dead lambs is greatly increased.

The number of days a lamb is carried *in utero* does not seem to have any effect on its size.

The largest per cent of increase is due to twin lambs, and there is no appreciable difference in the per cent of twins of the different breeds.

The production of twin and triplet lambs is detrimental to the strength and vitality of lambs at birth.

Shropshire ewes appear to be more prolific than any other breed.

Ewes six years old produce the largest per cent of increase while young ewes have the greater per cent of single lambs. The per cent of ram lambs increases and the per cent of ewe lambs decreases as the age of the ewe advances.

A ram is at his best at two and three years of age.

The age of the ram does not have any effect on the sex of the offspring.

Ram lambs average about one-half pound heavier at birth than ewe lambs.

The larger the ewe the greater the per cent of increase, while the ram has no effect on the lambs in this respect.

The size of the ewe and not the size of the ram determines the size of the lamb.

THE PORTABLE HOG HOUSE.*

J. G. FULLER.

The Twenty-Third Annual Report of this Station describes two types of small portable hog houses in use at the University. The plans therein described for the A-shaped, or wigwam, house, have since been considerably modified and improved in order to adapt it to both summer and winter conditions.

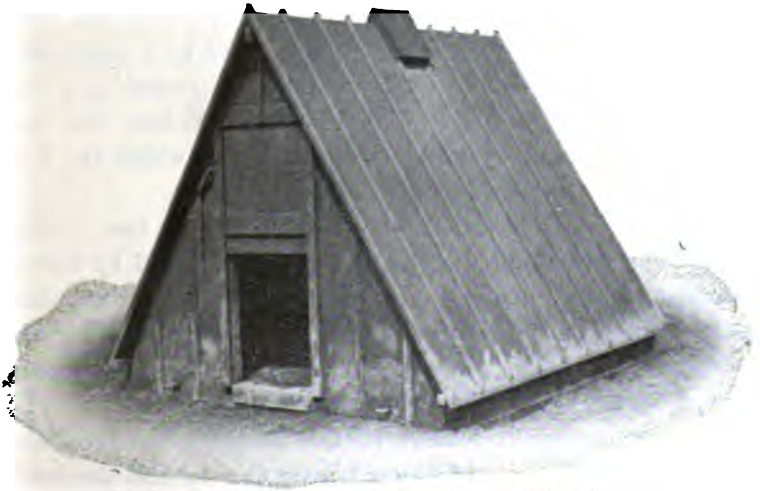

Fig. 1.—Front view of the A-shaped portable hog house.

Fig. 1 shows the improved A-shaped portable house, the main additional features being a permanent floor, a door in each end, and a ventilating system, all of which greatly increase the stability and utility of the structure. It is constructed by nailing inch boards on six joists 2 inches by 4 inches by 8 feet long for the floor. Beneath the joists are nailed three stringers 2 inches by 6 inches 8 feet long, which serve as runners for moving the house. Next is spiked a piece 2 inches by 8 inches 9 feet 4 inches long at the ends of the joists, having the bottom of the 2 by 8 even with the bottom of the joist which will allow it to project above the floor 3 inches. It will also extend out 7 inches at each end. This 2 by 8 forms a plate to which the rafters and roof boards are nailed. The 7 inch extension of the plate at the ends supports the lower corners of the roof which otherwise would be easily split off. These 2 by 8's, besides strengthening the house, raise the rafters and roof boards nailed to them at least three inches off the floor and thereby materially increase the floor space and the capacity of the house.

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* Abstracted from Bul. 153 of Wis. Expt. Sta.

If the house is to be used in extremely cold weather an easily manipulated door is necessary. The cut shows a door 2 feet wide and 2 feet 6 inches high, made to slide up and down and held in place by cleats. It is suspended by a rope which passes through a pulley at the top and is fastened to a cleat at the side near the roof. The cut also shows two iron eyes, bolted into the front joist of the building, to which the hitch is made when the building is moved.

A rear door, identical in size with the front door, is held in place by cleats nailed across it on the inside and by buttons fastened on the outside. This door is not opened regularly but provides ventilation in summer and aids in handling sows at farrowing time. Above the rear door is a small sliding door, 8 inches by 12 inches, to admit light and air.

Another important feature of this house is the ventilator, which is a small cap covering a hole at the top and the center of the roof. The hole is made by sawing off opposite ends of two roof boards and covering it with a cap so arranged as to leave openings 3 inches by 12 inches on each side of the roof. This is sufficient ventilation for two or three animals when all the doors are shut; and if more ventilation is desired it can easily be secured by opening the small sliding door in the rear. This simple plan of ventilation avoids any direct drafts upon the animals and proves very efficient.

With these improvements the cost in building the A-shaped house is somewhat increased. All the boards except those used for the floor should be dressed on one side.

The following lumber is necesary to construct this portable house as shown in Fig. 1: 9 pieces 1 inch by 12 inches 16 feet long, and 11 O. G. battens 16 feet long, for roof; 5 pieces 1 inch by 12 inches 14 feet long, for ends; 1 piece 2 inches by 4 inches 10 feet long, for ridge; 2 pieces 2 inches by 8 inches 10 feet long, for plates; 7 pieces 2 inches by 4 inches 16 feet long for rafters and braces in frame; 3 pieces 2 inches by 6 inches 8 feet long, for stringers; and 4 pieces 1 inch by 12 inches 16 feet long, rough, for flooring.

REPORT OF THE DEPARTMENT OF HORSE BREEDING.

A. S. ALEXANDER.

In accordance with the suggestions set forth in Bulletin 141 relative to amended legislation considered desirable in relation to existing laws regulating the public service of stallions, the Legislature having been asked, during its session of 1906–1907, to make the proposed changes, granted some of these but refused, through its committee of agriculture, to consider others. The changes proposed by the Department of Horse Breeding and granted by the Legislature included a clause endowing the Department with authority to refuse licenses to unsound stallions and to revoke existing licenses upon satisfactory evidence, through personal veterinary inspection where required, to the effect that the animal involved is afflicted with a disease considered hereditary, contagious, or transmissible; a list of diseases stipulated as hereditary, transmissible, or contagious and therefore constituting legal reason for rejecting an affected animal as unfit for public service; amendments including jacks with stallions for regulation under the law, necessitating a biennial renewal of license at a fee of one dollar, requiring veterinarians, as well as owners, to make affidavit to certificates relating to the soundness of stallions and jacks, permitting registered non-graduated veterinarians to examine stallions and jacks for soundness provided they show proof that they were in veterinary practice in Wisconsin for five years prior to 1887, providing a special license certificate for non-standard bred stallions, stipulating what shall constitute a legal stallion poster and making other portions and provisions of the existing law more readily understood.

The proposed legislation not approved included repeal of the law allowing owners to make personal affidavit to soundness of stallions; provision for state veterinary inspection of stallions; state approval of those stallions found on examination to be especially worthy of such distinction and a clause requiring that the sire of each horse, granted a license certificate as a "grade", be pure-bred.

Since the publication of Bulletin 141, which gave a directory of the owners of licensed stallions in Wisconsin, licenses have been granted to 219 additional pure-bred stallions and 413 grade stallions. The names and addresses of these owners are given in Bulletin 155, along with the original list of owners republished from Bulletin 141 the edition of which has been exhausted. Bulletin 155 also gives the full text of the amended stallion law, notes and comments on its provisions, observance and enforcement, and other matters of interest in the same connection.

The table shows the number and breed of stallions licensed in Wisconsin during the years 1906 and 1907.

TABLE I.—*Number and breed of licensed stallions in Wisconsin.*

Breed.	1906.		1907.	
	Pure-bred.	Grade.	Pure-bred.	Grade.
Percheron	455	894	92	175
Clydesdale	66	119	17	26
Belgian	50	52	17	11
Shire	39	106	10	16
French Draft	37	10	6	8
Suffolk	3	1	....	....
Trotter	272	325	59	56
Morgan	11	53	2	9
Thoroughbred	2	1	....	....
French Coach	54	33	2	8
German Coach	39	24	....	6
Cleveland Bay	4	10	....	2
Hackney	10	8	9	....
Pacer	3	....	....	2
Saddle	3	....	....	....
Shetland	2	7	....	4
Jack	5	3	3	2
Non-Standard Bred*	12	....	2	....
Arabian	....	6	....	....
Western	....	2	....	2
Coach	....	10	....	5
Canadian	....	4	....	1
Orloff	....	3	....	....
Unknown breeding	....	90	....	46
Mixed breeding	....	....	....	34
Total	1067	1561	219	413

*Being recorded were temporarily given pure bred certificates, marked "Non-Standard Bred." Now have a separate class.

During the past year Iowa, Minnesota, Pennsylvania, and Utah have followed the example of Wisconsin and enacted stallion service regulation laws framed after the one in force here, and several other states have similar legislation pending or in course of preparation. Particulars as to the new laws referred to are given in Bulletin 155 and the Department has aided those in charge of the stallion regulation in other states in carrying out their work and creating an interest in the improvement of horses.

THE UNIVERSITY DAIRY HERD, 1906-1907.

GEO. C. HUMPHREY AND F. W. WOLL.

The present University dairy herd was established in 1898, since when records have been kept of the feed consumption and the milk and butter fat production of all the cows which have been in the herd. Each year has been divided into a summer and a winter feeding period, since more accurate records could be made in the winter of the feed consumed than in the summer when the cows received pasture. Records have been made, however, of the time the cows received pasture and a charge made for it in figuring the cost of each cow's annual production. The management of the herd, aside from the recording of data, has been similar to that practiced by many of the most modern dairymen, and in all instances, the rations fed have been such as are within the reach of practical dairymen and adapted to conditions in the north central states.

The main object of the investigation has been to study the relation between the composition of rations and the production of dairy cows. The study has been made with special reference to the influence of a high versus a medium protein ration on the character of the milk and on the economic production of milk and butter fat. Only by making comparisons of the results of different series of years and more especially of the winter periods when the rations have varied with regard to their protein contents, can any solution to this problem be found, and it will be necessary to continue the work several years longer before any definite conclusions can be drawn.

It has become customary to present the herd data as part of the annual report, since incidental to the study of the principal problem stated above, the data are of interest and of use in showing the merits and economy of different rations fed from year to year, as well as in determining in a degree the relative merits of cows differing in type, breed, age, live weight, and other features pertaining to individuality. Bulletin No. 102 of this Station contains a history and a record of the University dairy herd for the period from 1898 to 1903, during which time the herd consisted principally of high-grade cows of five different breeds and was fed rations comparatively low in protein, the nutritive ratio being on the average 1:7.6. Commencing with the Twenty-First Annual Report and in the two following will be found articles which cover the period from 1903 to 1906, during which time the herd was composed principally of pure-bred animals and fed a ration rich in protein, the nutritive ratio being on the average 1:6.2. Thus one can refer to the history and records of the present herd from the time of its establishment to the beginning of the year considered in this article.

It was decided at the beginning of the year under consideration to return again to the use of a lower protein ration, in order to secure data that would permit further comparisons being made as to the relative merits of the two rations in question. The principal grain ration fed during the year was wheat bran, oats, corn, and distillers' grains in the proportions of 3:3:2:2. Oil meal, cotton seed meal, gluten meal, dried brewers' grains, and dried molasses beet pulp, have been fed irregularly and in small quantities, but on the whole the rations have been of a less nitrogenous character than they were for the three years previous. This will be noted in Table VIII which shows the average winter rations of the cows in the dairy herd.

COWS IN THE DAIRY HERD, 1906–1907.

The following table gives the names of thirty-four cows in the University dairy herd which are given consideration in this year's report. Twenty-three of these cows completed a year's record on May 14, 1907, the close of the period here considered, and the entire number will be included in the discussion of winter rations.

childe 4th, Holstein, the most profitable producer in the University dairy herd during the past year.
net profit $90.16.

TABLE I.—*List of cows in University dairy herd, 1906–1907.*

NAMES OF COWS.	Breed.	Date of birth.	DATE OF CALVING.								
			1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Brown Bessie's *Laura* Lee, 140963	Jersey	Jan. 20, '95			Spring.	Aug. 6.	July 26.	Oct. 3.		Apr. 26.	May 5.
Brownie	Jersey	1897			Aug. 6.	Nov. 5.	Dec. 1.	Dec. 24.		May 2.	
Double Time, 157531	Jersey	Mar. 25, '99					Mar. 16.	Sept. 17.	Sept. 14.		
Macella 3d, 149721	Jersey	Nov. 17, '99					Aug	Sept. 11.	Sept. 24.	Oct. 3.	
Perchance, 153118	Jersey	Nov. 27, '99						Sept. 1.	Sept. 26.	Sept. 18.	
Diploma's *Broadway*, (132562)	Jersey	May 3, '98						Feb. 6.	Feb. 25.	Mar. 10*	
Just in Time, 177907	Jersey	Mar. 15, '03							June 18.	July 7.	
Sadie Miller, 184272	Jersey	Sept. 25, '03								Aug. 21.	
Macella's *Jewel*	Jersey	Sept. 11, '04								Dec. 2.	
Fair *Cozie*, 15690	Guernsey	Jan. 25, '00					Dec. 18.	Dec. 10.		Mar. 17.	
Floradora of Tawawa, 14485	Guernsey	June 4, '01					May		Apr. 30.	May 3.	
Fair Cozie's *Queen*, 17217	Guernsey	Dec. 16, '03								Feb. 7.	
Hopeful *Mollie*, 18768	Guernsey	April 2, '04								Oct. 22.	
Handsome Gypsy (*Hannah*) 18769	Guernsey	May 1, '04								Oct 18.	
Model *Countess*, 18770	Guernsey	May 18, '04								Dec. 29.	
Dorine	Gr. Guernsey	1900				Jan. 1	Mar. 12.	Mar. 31.	May 29.	June 23.	
Muriel	Gr. Guernsey	1900				Mar. 18.	April 1.	April 3.	Jan. 5*	June 10	
Alma Marie 3d, 41417	Holstein	Mar. 23, '96	Aug. 13	Sept. 12	Aug. 24.	Dec. 14.		Jan. 20.	Mar. 28.	Mar. 12.	Feb. 4.
McGeoch	Holstein	1899			Jan. 19.	Feb. 11.	Feb. 7.	July 25.		Jan. 10.	Jan. 8.
Alma Marie Josephine (*Joe*) 54846	Holstein	Aug. 13, '99			Aug. 6.	Nov. 5.	Dec. 1.		Apr. 4.	Apr. 27.	Apr. 10.
Maggie Morris 2d, 49440	Holstein	Mar. 25, '98					Mar. 19.	Aug. 31.	Oct. 8.	Oct. 1.	
Netherland *Artis* Mechthilde, 59609.	Holstein	Sept. 13, '01					Dec. 5.		Apr. 2.	Apr. 8.	Apr. 30.
Josephine De Kol Pietertje, 59608	Holstein	Aug. 6, '01					Sept. 18.	Dec. 14.		May 5.	
Johanna Clothilde 4th, 60986	Holstein	Nov. 8, '01					Dec. 25.	Dec. 17.	Dec. 7.		Feb. 4.
Alma *Maxie* Netherland, 66417	Holstein	Dec. 14, '02						Dec. 25.	Dec. 9.	Nov. 17.	
Kakenstein Alma *Marie*, 69071	Holstein	Jan. 19, '04								Jan. 28.	Feb. 8.
Kakenstein *Ormsby* Josephine, 69569	Holstein	Dec. 1, '03								Sept. 18.	
Clara Barton, 1567	Brown Swiss	Sept. 19, '97						Jan. 27	Feb. 14.	Apr. 19.	
Countess 8th (*Irma*), 1650	Brown Swiss	Mar. 25, '98									Jan. 29.
Merney, 2859	Brown Swiss	Oct. 3, '02								Jan 1, N24	
Priscilla S. 3d, 13724	Ayrshire	April 1, '98								Jan. 31.	Feb. 20.
Christina S., 15921	Ayrshire	Nov. 18, '98							Oct. 3.	Nov. 3.	
Adelaide S., 15923	Ayrshire	Jan. 5, '99								Jan. 21.	Mar. 22.
Jeanette S., 15928	Ayrshire	Jan. 16, '00								Mar. 8.	Mar. 7.

*Aborted.

It was decided a year ago to have our herd consist of only the recognized dairy breeds, and the above number includes nine Jerseys, eight Guernseys (two grades), ten Holsteins, four Ayrshires, and three Brown Swiss. Fourteen of the above cows have been added to the herd during the year, eight of them being heifers bred at the University. The following descriptions of the new cows in the herd, with one exception (Ormsby), accompanied by photographs, are given.

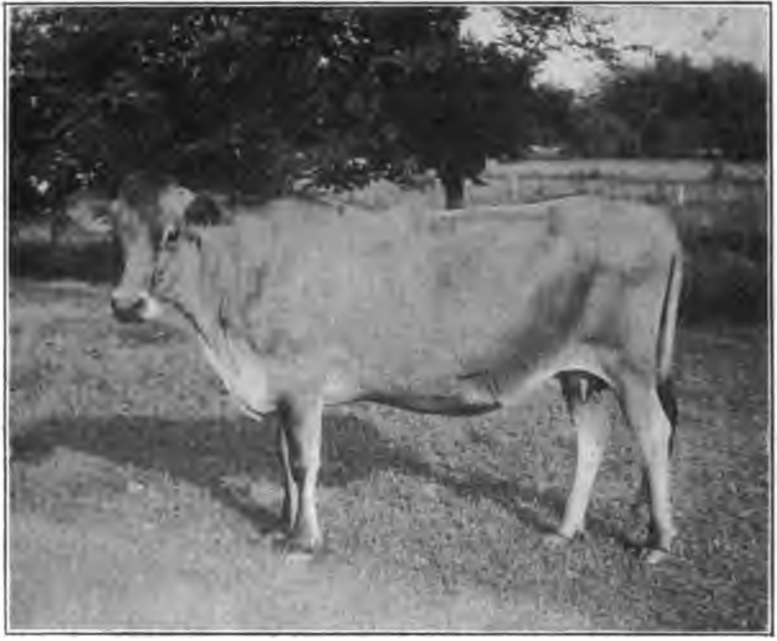

Fig. 3.—Sadie.

DESCRIPTION OF COWS ADDED TO THE DAIRY HERD DURING 1906–1907.

SADIE MILLER, 184272, (Sadie).—Jersey, dropped September 25, 1903; bred at the University; sire, Justice Ryan, 60352; dam, Lucy Miller, 89115, (see page 79, Twenty-Second Annual Report). Sadie had the misfortune to be accidentally bred to freshen when only eighteen months old at which age she was so small and produced so little milk that she was dried off and turned out with a view to letting her grow. At the present time she is a good sized cow for her age, but her udder and milk veins are very small and not in proportion to her body capacity. She freshened the second time when thirty-five months old and her weekly production of butter fat since then has never exceeded six pounds, except in one instance, and with two exceptions has never gone below four pounds, which indicates that drying her off so soon after dropping her first calf had no effect upon her persistency. Her production, however, is small. Her test for butter fat during the past winter was 4.64 per cent. Sadie will be retained in the herd and her development will be noted with interest, since her mother was a most excellent dairy cow.

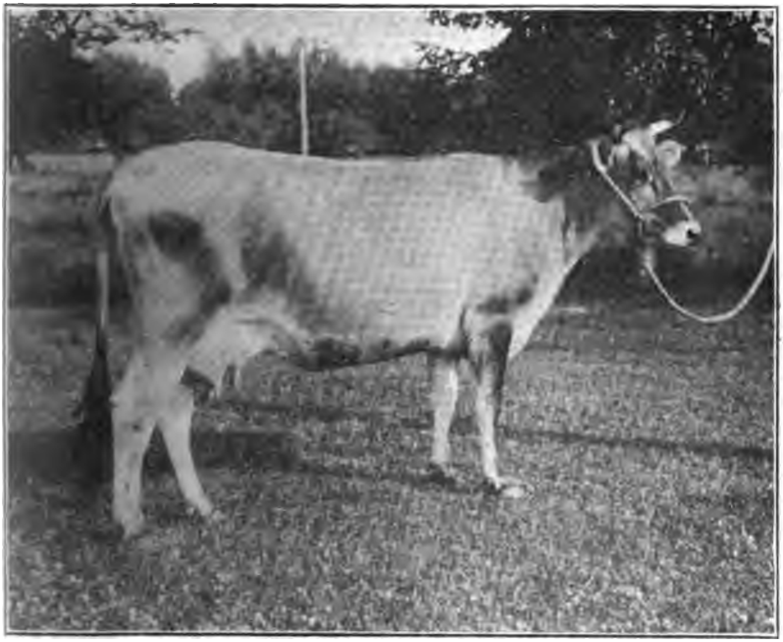

Fig. 4.—Jewel.

MACELLA'S JEWEL, 195212, (Jewel).—Jersey, dropped September 11, 1904; bred at the University; sire, Brown Bessie's Knight, 53554; dam, Macella 3d, 149721, (see "Macella", page 81, Twenty-First Annual Report). Jewel does not compare with her mother as a heifer nor does she promise to become so good a cow. With the exception of her shoulders being slightly heavy, her form is very good. She shows a strong dairy temperament in her clean-cut features and active disposition, but her udder is quite deficient in the development of its forequarters, one of which has produced but very little milk during her present lactation period. Her teats are also unevenly placed. In spite of her deficiencies, her production as a two-year old has been satisfactory, her average weekly production of butter fat for twenty-two weeks during the past winter, being 7.4 pounds, which is equivalent to over 8.5 pounds of churned butter. Her average test for butter fat was 5.81 per cent.

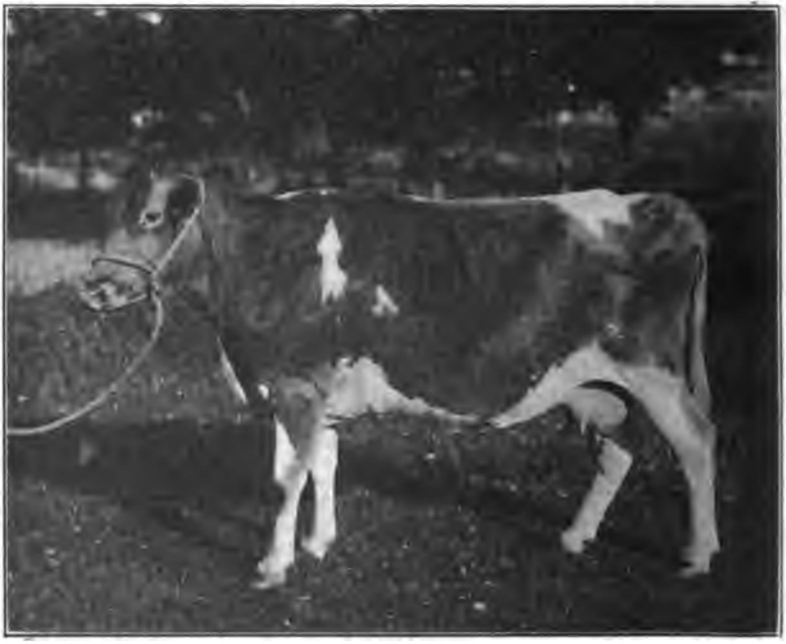

Fig. 5.—Queen.

FAIR COZIE'S QUEEN, 17217, (Queen).—Guernsey, dropped December 16, 1903; bred at the University; sire, Sir Bonnie, 6084; dam, Fair Cozie, 15690, (see page 76, Twenty-Second Annual Report). Queen has distinguished herself by entering the Advanced Registry of the American Guernsey Cattle Club as a two-year old with a yearly production of 7702 pounds of milk and 380.81 pounds of butter fat. Her average test for butter fat was 4.94 per cent. In temperament and production, considering her age, she excels her mother. She lacks beauty and symmetry of form by having a ewe-neck and rather plain head, with some black hair about the nose. Her body is deep and capacious and her udder is good sized and of excellent quality, although somewhat deficient in the fore-quarters. Her milk veins are rather short but prominent and tortuous. She weighs about 770 pounds and undoubtedly will always be somewhat below the standard weight for cows of her breed.

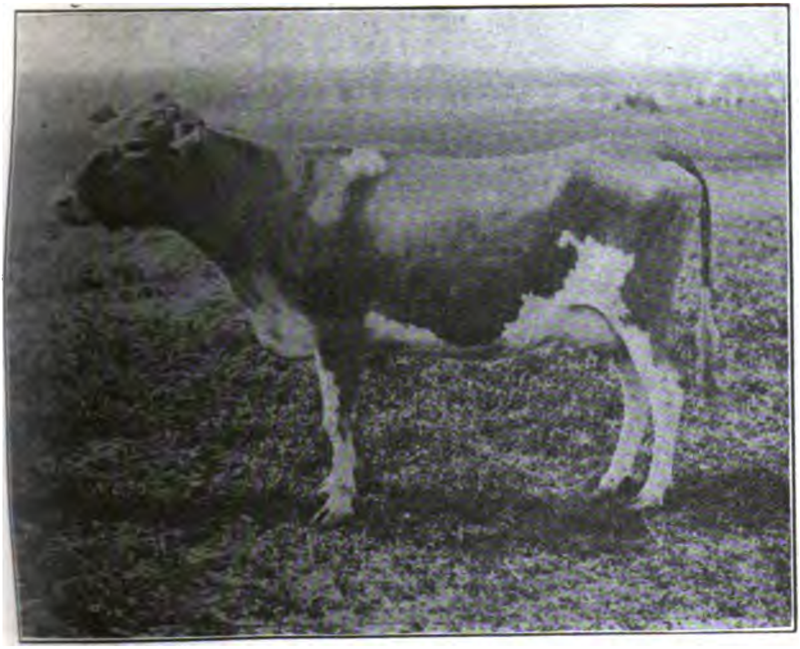

Fig. 6.—Mollie.

HOPEFUL MOLLIE, 18768, (Mollie).—Guernsey, dropped April 2, 1904; bred at the University; sire, Gypson's Count, 8125; dam, Jennie Hopeful 2d, 13428, (see "Jennie", page 81, Twenty-First Annual Report). Mollie is a great improvement over her mother in size, dairy form, and temperament. She appears somewhat throaty and her udder is a little fleshy and slightly deficient behind, but her clean-cut face, good muzzle, deep body and tendency to produce milk makes her a very promising heifer. Her milk veins are short but prominent and tortuous. Her test for butter fat for the past winter was 5.2 per cent.

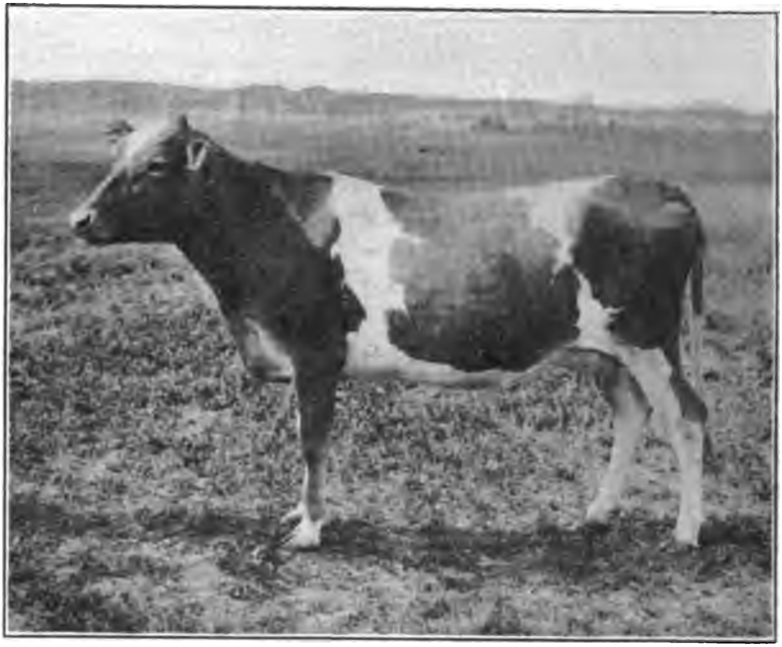

Fig. 7.—Hannah.

HANDSOME GYPSY, 18769, (Hannah).—Guernsey, dropped May 1, 1904; bred at the University; sire, Gypson's Count, 8125; dam, Flashlight, 13427, (see page 83, Twenty-First Annual Report). Hannah does not impress favorably one who is accustomed to criticizing dairy cows. She has a dull, listless expression, is somewhat heavy in the shoulders and drops in the back. Her udder is unevenly developed, the left side being considerably the smaller, and her production has not compared favorably with that of her two half sisters, Mollie and Countess. She will be given further trial, however, as she is continuing to grow and possesses sufficient merit to be a profitable producer.

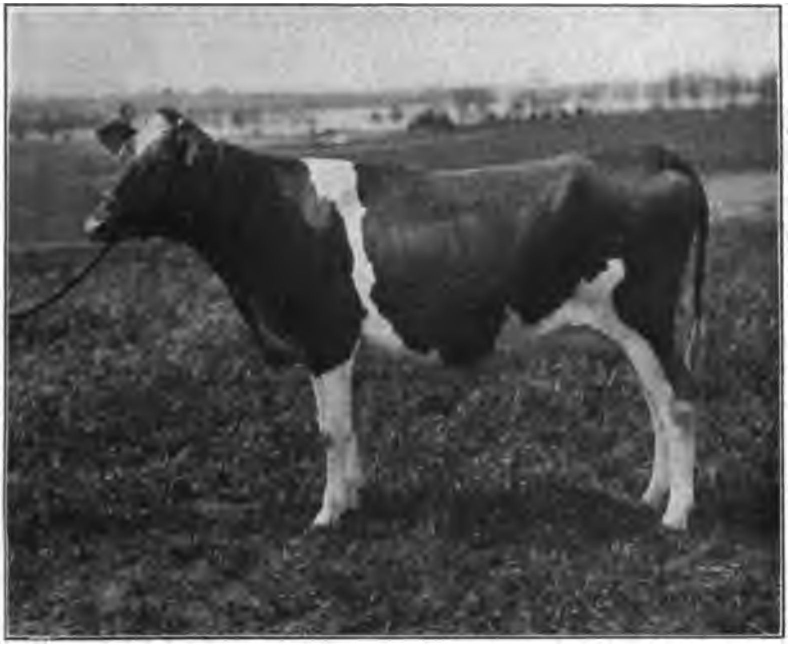

Fig. 8.—Countess.

MODEL COUNTESS, 18770, (Countess).—Guernsey, dropped May 18, 1904; bred at the University; sire, Gypson's Count, 8125; dam Model Times, 16592, (see "Model", page 79, Twenty-Second Annual Report). Countess may be criticized in being short-ribbed, which makes her body round rather than deep and her legs appear too long. Her muzzle is small and her neck and shoulders somewhat heavy. The udder is slightly deficient in the development of the fore-quarters; her veins, however, are large, tortuous and extend well forward. Before freshening Countess was quite fleshy, but her dairy temperament has been sufficient to work off her surplus flesh and her production as a heifer has been very satisfactory. She has a rich oily secretion and a fine handling quality. Her average test for butter fat during the past winter was 4.48 per cent.

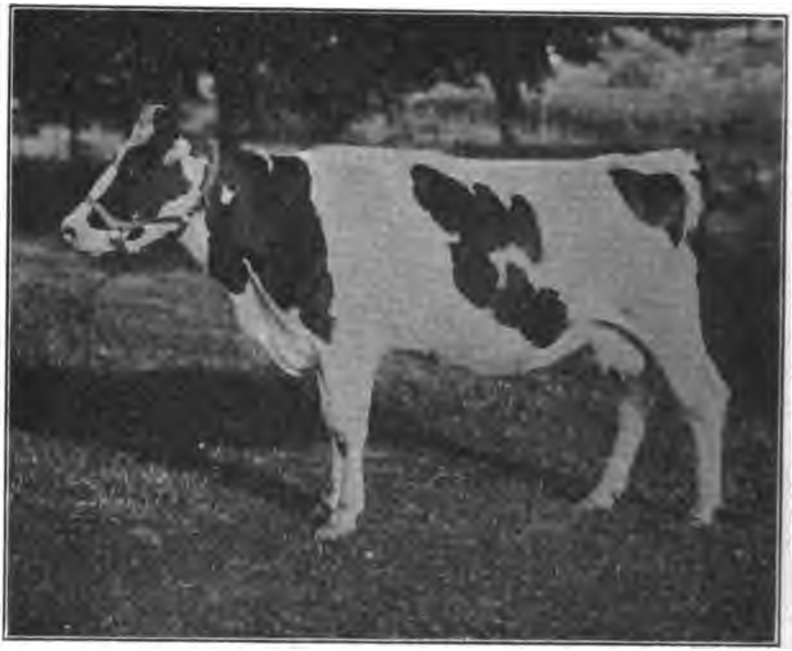

Fig. 9.—Marie.

KAKENSTEIN ALMA MARIE, 69071, (Marie).—Holstein, dropped January 19, 1904; bred at the University; sire, Kakenstein Sir Ormsby, 31207; dam, Alma Marie 3d, 41417, (Alma). Like the two other daughters of Alma in the dairy herd, Marie has strong dairy tendencies. She also has the characteristic features of being deficient in the forequarters of her udder and testing on the average between 3 and 3.5 per cent of butter fat. She is rather long-legged and somewhat narrow in body. Her yearly production as a two-year old was 7864 pounds of milk and 256.86 pounds of butter fat, equivalent to 300 pounds of butter.

KAKENSTEIN ORMSBY JOSEPHINE, 69564, (Ormsby).—Holstein, dropped December 1, 1903; bred at the University; sire, Kakenstein Sir Ormsby, 31207; dam, Alma Marie Josephine, 54846, (Joe); granddam Alma Marie 3d, 41417, (Alma). Joe and Alma have been two of the best Holstein cows in the University dairy herd and Ormsby promised to be their equal in size and form, but her test for butter fat was very low during the past winter, being only 2.87 per cent, and for this reason she was offered for sale and sold May 6, 1907. The principal criticism which could be offered relative to her was the low per cent of butter fat and her being too long-legged and rather round and narrow in the body.

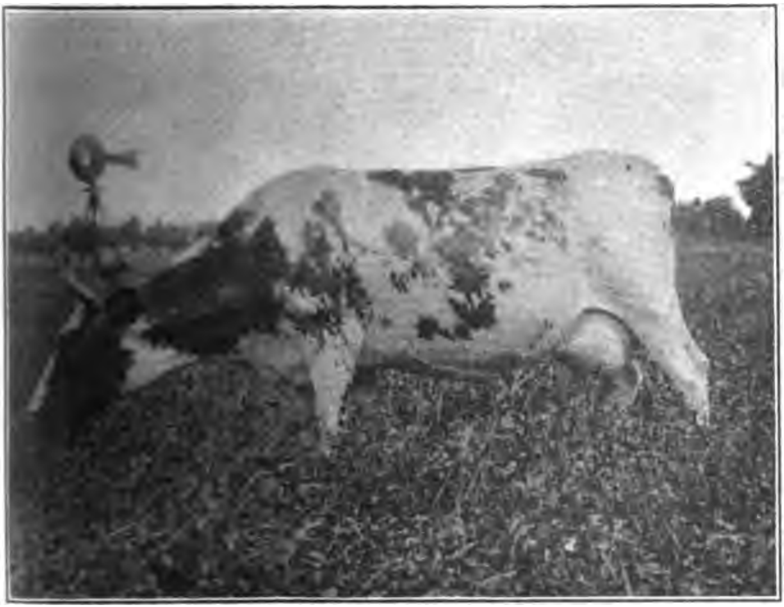

Fig. 10.—Priscilla.

PRISCILLA S. 3D, 13724, (Priscilla).—Ayrshire, dropped April 1, 1898; bred by W. C. Stowell, Black Creek, New York; sire, Norton, 5671; dam, Priscilla S., 11863. Priscilla 3d was purchased by the University of L. D. Stowell, Black Creek, New York, in the fall of 1906. With the exception of being somewhat undersized, she is a typical representative of her breed, possessing excellent dairy form, characteristic horns, and fashionable color markings. She has a nice pliable skin and rich oily secretion. Her udder is of good size and quality, and nicely developed in all the quarters. The teats are rather short and close together for convenient milking. Her milk veins are long, tortuous, and very prominent. Her average test for butter fat during the past winter was 3.95 per cent.

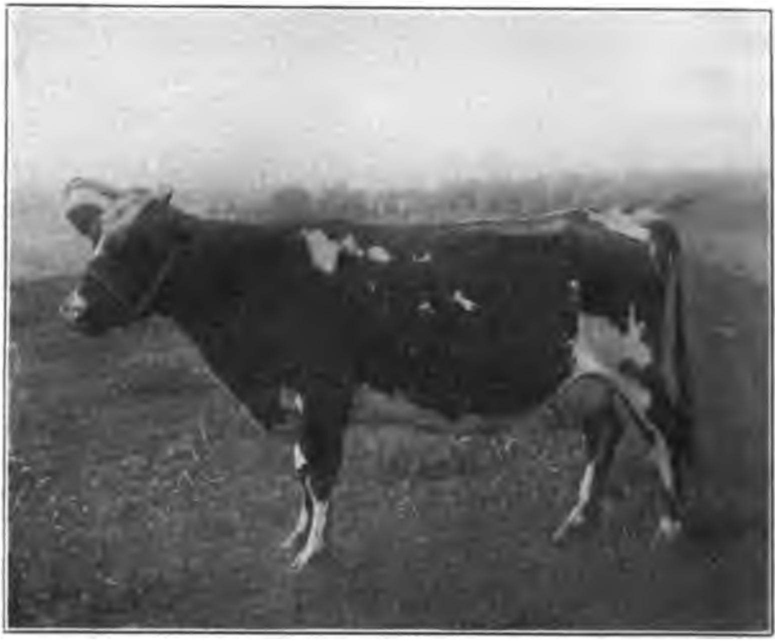

Fig. 11.—Christina.

CHRISTINA S., 15921, (Christina).—Ayrshire, dropped November 18, 1898; bred by L. D. Stowell, Black Creek, New York, of whom she was purchased by the University in the fall of 1906; sire, Norton, 5671; dam, Olive S, 10795. Christina freshened November 3, 1906, shortly after arriving at the University and has made a very satisfactory production during the past winter, considering the effect of a change of environment and of shipping her a long distance just prior to freshening. Her average test for butter fat during the past winter was 3.88 per cent and her highest weekly production of butter fat 10.79 pounds, equivalent to 12.5 pounds of butter. With the exception of being slightly throaty, her dairy form is hard to criticize. The udder is of good size but slightly deficient in the development of the fore-quarters. Her twist is somewhat full and low to permit the udder being well carried up behind. Her hind teats are rather small and close together.

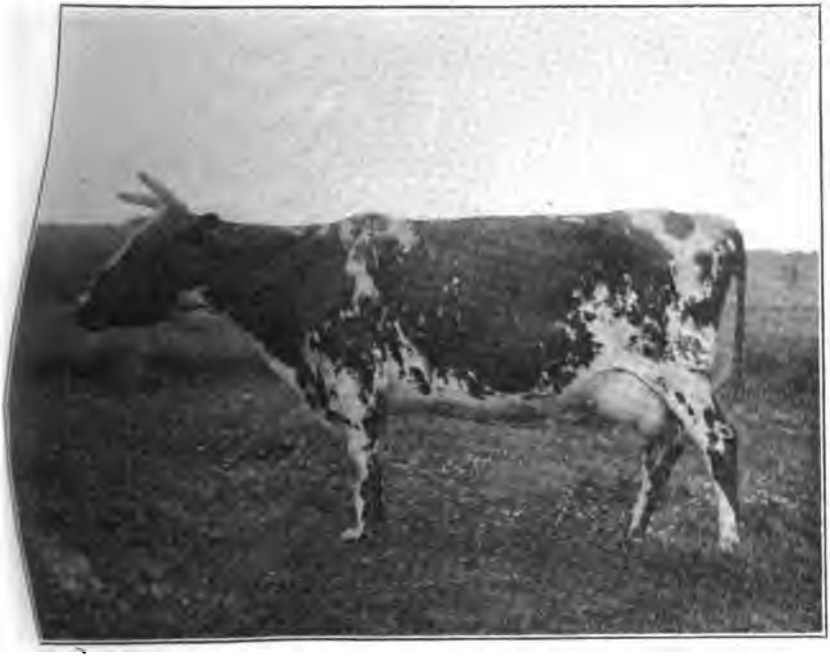

Fig. 12.—Adelaide.

ADELAIDE S., 15923, (Adelaide).—Ayrshire, dropped January 5, 1899; bred by L. D. Stowell, Black Creek, New York, of whom she was purchased by the University in the fall of 1906; sire, Norton, 5671; dam, Ellen S., 13504. Adelaide is a cow of extreme dairy type, weighing on the average about nine hundred pounds. She is refined in all parts of her body and shows a strong dairy temperament. She has a nice evenly developed udder of good size and a remarkable system of milk veins, as well as a system of veins on the udder which stand out prominently. The teats are medium long and may be criticised only in being somewhat too close together. Her average test for butter fat during the past winter was 4.4 per cent.

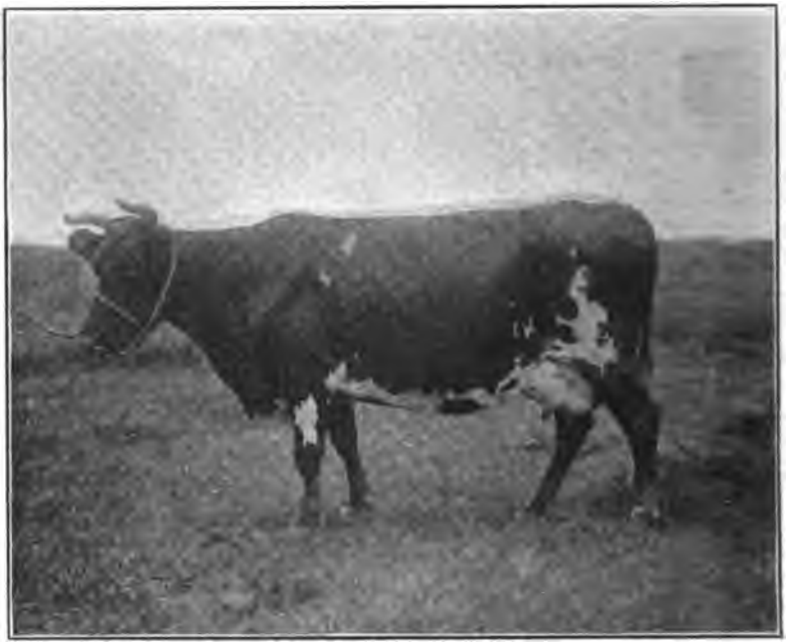

Fig. 13.—Jeanette.

Jeanette S., 15928, (Jeanette).—Ayrshire, dropped January 16, 1900; bred by L. D. Stowell, Black Creek, New York, of whom she was purchased by the Universtiy in the fall of 1906; sire, Norton, 5671; dam, Jean S, 11870. Jeanette is a large strong-bodied cow, red in color and more typical of the Shorthorn breed in many respects than of her own. Her head is somewhat short and broad and her brisket full and heavy which detracts somewhat from her general appearance as a dairy cow. Her teats are short and close together. She shows a tendency to take on flesh which may interfere with her being a persistent milker. She has, however, a large digestive capacity, a good sized udder, slightly deficient in the fore-quarters, and a dairy temperament which, so far as production is concerned, makes her very satisfactory. During the past eighteen weeks since she has freshened her production has averaged over 12 pounds of butter per week. Her average test for butter fat is about 3.8 per cent.

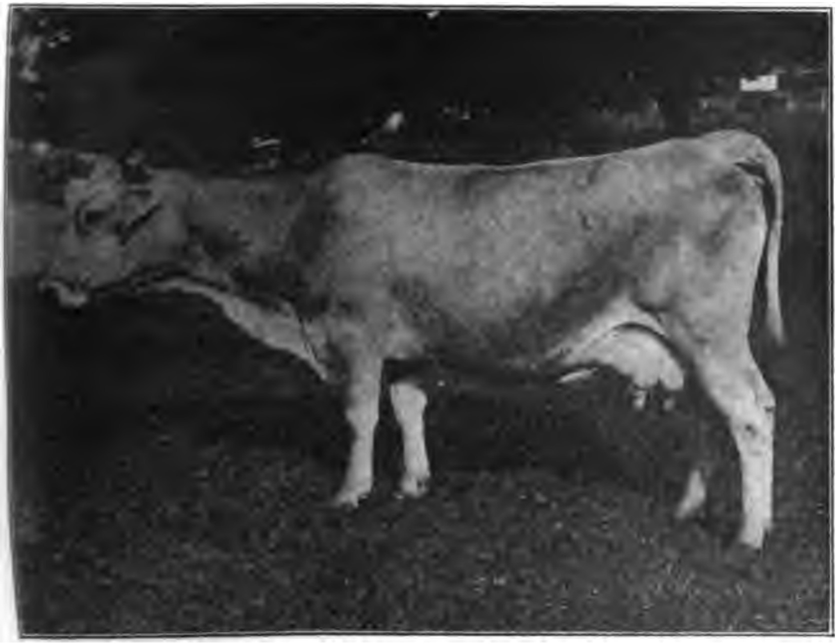

Fig. 14.—Irma.

COUNTESS 8TH, 1650, (Irma).—Brown Swiss, dropped March 25, 1898; bred and owned by Ira Inman, Orfordville, Wisconsin, by whom she has been loaned to the University for demonstrating the type, breed characteristics, and merits of her breed. Her general form is characteristic of the breed, although her weight is below the average, being only about 1,000 pounds in her present working condition. Her udder may be criticised in not being carried high and full enough behind. For some reason, which may be the change of environment, her condition and thrift have not been right during the past winter, and doubtless this has interfered with her production. Her average test for butter fat during the past winter was 4.14 per cent.

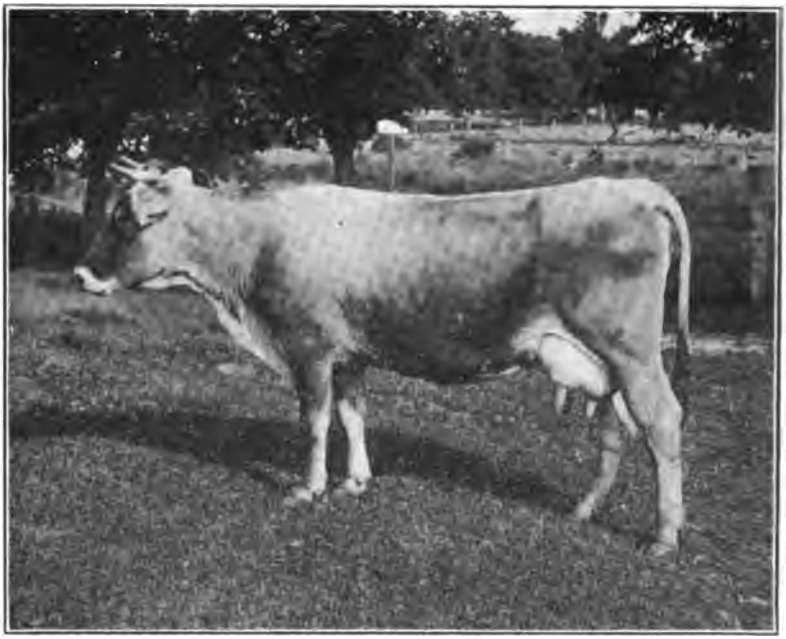

Fig. 15.—Merney.

MERNEY, 2859.—Brown Swiss, dropped October 3, 1902, bred and owned by H. W. Ayers, Honey Creek, Wisconsin, by whom she has been loaned to the University for demonstrating the type, breed characteristics, and merits of her breed. Her well developed udder and milk veins, and dairy temperament, enabling her to utilize her feed for milk production, class her as a dairy cow. Her average milk production for the past thirty weeks, since freshening, has been on the average 217 pounds of milk and 8.52 pounds of butter fat per week. Her average test for butter fat was 3.92 per cent. Her general appearance would be improved if she were deeper and larger in the body. The teats are large and well placed. Her average weight is 963 pounds, which is considerably below that of average cows of her breed.

CONDITION AND MANAGEMENT OF THE HERD.

The condition of the herd on the whole during the past year, was good, the most serious cases of sickness being two attacks of milk fever, suffered by Macella and Muriel, both of which were successfully treated, by injecting air into their udders, without the disease affecting their milk production materially. McGeoch, Josephine, Broadway, Clara, and Irma had slight attacks of garget. Broadway also suffered two days from a form of partial paralysis, and McGeoch injured her udder which caused an abscess to form externally and gave her considerable annoyance. Only in the case of Ormsby did any of the cows retain their after-birth at the time of freshening. Double Time persisted in not breeding at any time, and during the spring season suffered from rheumatism. Sadie, Queen, Hannah, McGeoch, and Adelaide were reported "off feed" for short periods. Irma for some reason did not thrive and take on the bloom which the other cows did and her production apparently suffered accordingly.

A Burrell-Lawrence-Kennedy milking machine was installed in the dairy barn in the fall of 1906 and used for milking sixteen cows more or less of the time during the winter months. This was a change in the care and management of the herd which doubtless directly and indirectly affected somewhat the average production of milk and butter fat for the year here considered. A report of the trial of this machine will be published later when its effect upon the cows will be clearly shown. The installation of the machine caused the regular hand milkers to change about which also affected the production of the hand-milked cows more or less unfavorably.

Acknowledgment is due Mr. C. J. McComb, Dairy Herdsman, and his Assistant, Mr. E. W. Fox, for their faithfulness and efficiency in managing and caring for the herd and testing the weekly composite samples of milk. The tables given in this report have been carefully compiled and arranged by Mr. Roy T. Harris, Assistant in Dairy Tests, to whom we are much indebted for the valuable help he has rendered. Credit is also due Mr. Geo. A. Olson, Assistant Chemist, for the analyses made of samples of feeding stuffs fed the herd during the year.

TABLE II.—*Feed consumption per cow, in pounds, University dairy herd, 1906–1907.*

No.	Name.	Hay.	Silage.	Soiling crops.	Bran.	Oats.	Corn.	Oil meal.	Molasses beet pulp.	Gluten feed.	Cotton seed meal.	Distiller's grains.	Brewers' grains.
1	Johanna	1,215	7,841	1,258	649.2	649.2	366.6	196.0	213.0	89.2	....	409.8	....
2	Double Time	1,023	7,368	1,134	703.6	508.5	285.6	....	211.0	53.4	98.0	535.0	....
3	Macella	1,142	7,536	714	719.7	548.3	362.0	270.0	117.0	....	85.4	532.8	....
4	Alma	1,209	7,998	1,336	707.8	439.8	377.2	98.0	213.0	....	134.6	561.2	....
5	Queen	1,023	5,909	1,092	537.7	537.7	268.0	....	173.0	89.8	....	357.8	....
6	Maxie	1,216	8,266	1,218	670.0	455.4	302.2	352.6	213.0	....	108.2	517.4	....
7	Dorine	1,038	7,168	1,168	597.0	597.0	287.0	....	207.0	111.0	....	398.0	....
8	Muriel	1,028	6,598	1,114	494.4	494.4	224.4	....	207.0	105.2	....	332.8	420.0
9	McGeoch	1,210	7,684	1,338	633.4	283.4	245.8	151.2	213.0	....	122.8	486.0	....
10	Cozie	1,028	6,546	1,104	507.0	507.0	259.2	....	211.0	101.2	....	310.0	56.0
11	Brownie	1,023	7,074	1,104	548.4	548.4	204.4	....	211.0	152.8	....	357.2	....
12	Joe	1,211	8,075	1,287	564.0	564.0	229.6	62.5	213.0	146.4	....	376.0	....
13	Josephine	1,223	9,294	1,396	484.2	484.2	190.4	210.0	203.0	182.4	....	322.8	....
14	Maggie	1,213	8,494	1,294	621.4	533.4	453.6	278.0	....	....	44.0	443.6	70.0
15	Floradora	1,033	6,920	1,202	528.9	528.9	282.8	....	211.0	103.4	....	330.2	....
16	Laura	1,038	6,639	1,094	477.0	477.0	229.6	11.0	211.0	112.2	....	294.2	....
17	Clara	1,178	7,790	1,184	542.1	264.6	176.4	....	213.0	....	139.2	453.9	....
18	Just in Time	1,028	6,920	1,114	512.3	506.7	236.6	....	206.0	101.2	2.8	343.4	....
19	Marie	1,211	7,668	1,202	393.1	369.6	243.6	189.0	213.0	....	112.2	443.8	....
20	Artis	1,162	7,480	1,220	415.2	415.2	148.4	....	213.0	128.4	....	276.8	....
21	Broadway	1,028	6,210	984	236.5	220.5	142.8	....	151.0	4.2	8.0	163.0	140.0
22	Perchance	1,038	6,852	758	388.8	338.4	225.6	45.0	....	....	25.2	276.0	....
23	Sadie	1,023	6,234	1,096	408.9	408.9	214.2	....	117.0	58.4	....	272.6	....
	Average (23 cows)	1,110	7,329	1,148	545.2	464.4	259.0	81.0	180.0	64.7	38.3	382.3	29.8

TABLE III.—*Production per cow, University dairy herd, 1906–1907.*

No.	NAME.	Live weight.	DAYS IN MILK.		Annual milk.	Per cent fat.	Annual fat.	Butter.	VALUE OF PRODUCTS.			Cost of feed.	Net profit.
			At beginning of year.	During year.					Butter.	Skim-milk.	Total.		
		Lbs.			Lbs.		Lbs.	Lbs.					
1.	Johanna	1,163	160	316	11,188.9	3.64	407.12	475	$95 00	$13 43	$108 43	$42 27	$66 16
2.	Double Time	946	244	364	7,963.8	4.98	397.69	464	92 80	9 58	102 38	39 44	62 94
3.	Macella	965	234	343	6,973.0	5.90	411.51	480	96 00	8 37	104 37	42 50	61 87
4.	Alma	1,088	65	316	12,019.5	2.90	348.53	407	81 40	14 42	95 82	42 61	53 21
5.	Queen	735	98	364	6,394.3	5.20	332.27	388	77 60	7 67	85 27	33 32	51 95
6.	Maxie	1,043	158	329	11,787.9	2.99	352.50	411	82 20	14 15	96 35	44 42	51 93
7.	Dorine	1,078	352	341	6,623.2	5.15	341.35	398	79 60	7 95	87 55	37 02	50 53
8.	Muriel	1,003	Dry	340	5,898.4	5.82	343.27	400	80 00	7 08	87 08	36 78	50 30
9.	McGeoch	1.375	126	281	9,288 3	3.58	332.10	388	77 60	11 15	88 75	39 15	49 60
10.	Cozie	951	60	364	5,810.2	5.60	325.32	380	76 00	6 97	82 97	33 95	49 02
11.	Brownie	998	14	364	6,281.6	5.21	326 99	381	76 20	7 54	83 74	35 49	48 25
12.	Joe	1,194	19	273	9,658.2	3 83	322.07	376	75 20	11 59	86 79	38 95	47 84
13.	Josephine	1,194	11	364	9,685.5	3.27	317.07	370	74 00	11 62	85 62	40 04	45 58
14.	Maggie	1,267	220	324	9,882.5	3.29	324.81	379	75 80	11 86	87 66	42 40	45 26
15.	Floradora	1,075	13	364	5,907.2	5.23	308.91	360	72 00	7 09	79 09	34 82	44 27
16.	Laura	939	20	321	5,842.4	4.65	271.45	317	63 40	7 01	70 41	33 07	37 34
17.	Clara	1,214	27	364	7,061.5	3.74	264.18	308	61 60	8 47	70 07	35 76	34 31
18.	Just in Time	889	332	325	5,323.2	4.98	265.04	309	61 80	6 39	68 19	34 23	33 96
19.	Marie	978	108	324	8,435.7	3.17	267.52	312	62 40	10 12	72 52	39 26	33 26
20.	Artis*	1,035	38	281	6,519.6	3.71	241.56	282	56 40	7 82	64 22	33 04	31 18
21.	Broadway	972	67†	364	3,333.9	6.21	207.13	242	48 40	4 00	52 40	25 91	26 49
22.	Perchance	993	232	313	4,708.3	4.35	204.96	239	47 80	5 65	53 45	28 91	24 54
23.	Sadie	921	Dry	268	3,913.7	4.58	179.21	209	41 80	4 70	46 50	29 62	16 88
	Average (23 cows)	1,044	113‡	331	7,413.9	4.16	308.37	360	71 96	8 89	80 85	36 65	44 20

*51 weeks. †After abortion. ‡Two cows dry.

DAIRY HERD RECORDS, 1906–1907.

The preceding tables contain a list of the cows which completed a year's record, and show for each cow the live weight, the kinds and amounts of feed eaten, the cost of feed, the number of days in milk during the year, the milk and butter fat production, the value of products, and the net profit over and above the cost of feed.

The cows are arranged in the tables in the order of decreasing net profits for the year. The following schedule of prices has been used in calculating the cost of feeds fed and in determining the value of products. The low prices of feed, which are the same as last year for the sake of comparison, are fully offset by the low valuation of products, which also remains the same as in the past. The amount of butter has been calculated by adding one-sixth to the number of pounds of butter fat, and the skim milk by taking eighty per cent of the number of pounds of milk.

SCHEDULE OF PRICES OF FEEDS AND PRODUCTS.

Hay, per hundred pounds	$0 40
Corn silage, per hundred pounds	12½
Soiling crops, per hundred pounds	07½
Pasture for season	4 50
Wheat bran, per hundred pounds	75
Oats, per hundred pounds	80
Corn, per hundred pounds	70
Oil meal, per hundred pounds	1 20
Molasses beet pulp, per hundred pounds	80
Gluten feed, per hundred pounds	1 10
Cotton seed meal, per hundred pounds	1 30
Distillers' grains, per hundred pounds	1 10
Brewers' grains, per hundred pounds	80
Butter, per pound	20
Skim milk, per hundred pounds	15

DISCUSSION OF HERD RECORDS, 1906–1907.

The figures given in Table III do not represent the maximum yearly production of the cows, but are the productions for the respective number of days each cow was milked during the year ending May 14, 1907. The Holstein cow Johanna gave milk 316 days during the year and produced 11,188.9 pounds of milk and 407.12 pounds of butter fat, equivalent to 475 pounds of butter. According to the prices in the above schedule, the total value of her products was $108.43 and the cost of feed $42.27, making a net profit of $66.16, over and above the cost of feed, which exceeds that of any other cow. A year ago Johanna ranked second in the herd in net profit yielded, with a production of 11,681.5 pounds of milk, 430.29 pounds of butter fat, and a net profit of $64.59. Her maximum yearly production was made during the year ending December 5, 1906, when as a four-year old she produced 14,856 pounds of milk and 542.35 pounds of butter fat, equivalent to 633 pounds of butter. She has always been an economical producer. In Table III, it will be noted that the cost of feed for her is exceeded by the Jersey cow, Macella, ranking third in net profit and by three other Holstein cows, Alma, Maxie, and Maggie, ranking fourth, sixth, and fourteenth, respectively, in net profit. Alma and Maxie also exceeded Johanna in the number of pounds of milk which they produced, but the difference in the per cent of butter fat in the cost of feed has rendered them less profitable.

The Jersey Cow, Double Time, ranked second in net profit by virtue of her excellent dairy qualities which enabled her to persist in making a good production in spite of her not breeding regularly, as previously referred to.

Macella, another Jersey cow, ranks third with a production of 6,973 pounds of milk and 411.51 pounds of butter fat, yielding a profit of $61.87. She also ranked third a year ago with a somewhat higher production and a net profit of $63.55. She and Johanna each have a fine calf to their credit in addition to the net profits returned.

In contrast with the three best cows of the herd, it will be noted that only three of the poorer ones have failed to return a net profit of $30.00. Sadie, the poorest cow and yielding a profit of only $16.88, has already been described (see page 50). Perchance has never been a strong milk producer and has the disadvantage of testing low in butter fat. Broadway had the misfortune to abort two months prior to the commencement of the year and could not be expected to do more than she has.

The twenty-three cows given in the foregoing table gave milk on the average 331 days during the year, and the average production was 7,413.9 pounds of milk and 308.37 pounds of butter fat, equivalent to 360 pounds of butter. The average value of their product was $80.85 and the average cost of the feed eaten $36.65, leaving an average net profit of $44.20 per cow for the year. The average cost of feed per hundred pounds of milk for the whole herd on the basis of the above figures was 49.4 cents, and the cost of feed per pound of butter fat, 11.8 cents. The above figures show an improvement in the producing value of the herd as compared with that of the two preceding years. It lacks considerably, however, in reaching the high average results of the year 1903–1904, when twenty-one cows yielded an average net profit of $48.66.

CHANGES IN LIVE WEIGHT.

To ascertain the change in the live weights of the cows during the year and the winter, respectively, average figures for the first three and the last three regular weekly weighings of each period were compared and the gain or loss noted. In a few instances, parturition during, or shortly before or after, the period considered, made it impossible to determine the influence of the system of feeding on the live weights of the cows. The following table gives the average live weights of all the cows for both the beginning and the end of the year and of the winter period, with the gain or loss as the case may be.

TABLE IV.—*Average live weight, in pounds, University dairy herd 1906-1907.*

NAME OF COW.	FOR THE YEAR.			FOR THE WINTER PERIOD.		
	Beginning.	End.	Difference.	Beginning.	End.	Difference.
Laura	894	981	+87	943	981	+38
Brownie	975	1,073	+98	1,003	1,073	+70
Double Time	944	950	+ 6	950	950	....
Macella	938	980	+42	973	980	+ 7
Perchance	954	1,001	+47	994	1,001	+ 7
Broadway	895	1,048	+153	988	1,048	+60
Just in Time	805	967	+162	895	967	+72
Sadie	882*	926	+44	936	926	−10
Jewell	....	....	....	871	904	+33
Cosie	861	1,010	+149	979	1,010	+31
Floradora	1,020	1,138	+118	1,098	1,138	+40
Queen	643	798	+155	760	798	+38
Mollie	....	....	....	899	937	+38
Hannah	....	....	....	879	893	+14
Countess	....	....	....	930	898	−22
Dorine	1,070	1,134	+64	1,096	1,134	+38
Muriel	978	1,049	+71	1,014	1,049	+35
Alma	1,061	1,040	−21	1,163*	1,040	−123
McGeoch	1,303	1,284	−19	1,499*	1,284	−215
Joe	1,062	1,183	+121	1,208*	1,183	−25
Maggie	1,235	1,178	−57	1,259	1,178	−81
Artis	955	1,135*	+180	1,058	1,135*	+77
Josephine	1,144	1,300*	+156	1,178	1,300*	+122
Johanna	1,092	1,173	+81	1,242*	1,173	−69
Maxie	971	1,050	+79	1,053	1,050	− 3
Marie	855	972	+117	1,060*	972	−88
Ormsby	....	....	....	1,107	1,088	−19
Clara	1,209	1,284	+75	1,208	1,284	+76
Irma	....	....	....	1,011*	976	−35
Merney	....	....	....	943	971	+28
Priscilla	....	....	....	916	886	−30
Christina	....	....	....	959	969	+10
Adelaide	....	....	....	849	798*	−51
Jeanette	....	....	....	1,065	1,109	+44

*Weight influenced by parturition during or shortly before or after period considered.

Yearly data are given for twenty-three cows and winter data for thirty-four cows in the above table. Of the twenty-three cows, three cannot be considered, owing to parturition influencing their weights. Seventeen cows gained during the year about sixty-eight pounds on the average, while three lost, not quite one-half of this amount. A discussion of the figures for the winter period will be given under the discussion of winter rations later in this article.

COMPARISON OF BREEDS, 1906-1907.

Where breeds have been carefully developed for specific dairy purposes, it is quite impossible to make a just comparison of them from the standpoint of production alone, especially where only one year's records are considered. Even a glance at Table III, showing the production of individual cows, will enable one to see that so far as the production of cows of our dairy breeds is concerned, individuality, stage of lactation, age, etc., are more important factors influencing the economic and profitable production of milk and butter fat than is the question of breed. It is perfectly natural, however, for men to want to know the relative standing of the breeds in our herd from year to year, and for this reason, a summary of the data given in Table III for eight Jerseys, five Guernseys, nine Holsteins, and one Brown Swiss has been made and the averages given in the following table:—

TABLE V.—*Comparison of breeds, University dairy herd, 1906–1907.*

	Jersey.	Guernsey.	Holstein.	Brown Swiss.
Number of cows included	8	5	9	1
Average weight of cows, pounds	953	968	1,149	1,214
Average age of cows, years	7	7	6	9
Days in milk during year, average	333	355	312	364
Average yield of milk, pounds	5,545.0	6,126.7	9,829.6	7,061.5
Average yield of fat, pounds	283.00	330.22	323.70	264.18
Average per cent fat	5.10	5.39	3.29	3.74
Average value of products	$72.68	$84.39	$87.35	$70.07
Average cost of feed	33.65	35.18	40.24	35.76
Average net profit	39.03	49.21	47.11	34.31

The average data in the preceding table show that the four breeds considered this year rank as follows:—

In production of milk: Holstein, Brown Swiss, Guernsey, and Jersey.

In production of butter fat: Guernsey, Holstein, Jersey, and Brown Swiss.

In cost of feed: Jersey (lowest), Guernsey, Brown Swiss, and Holstein (highest).

In average net profit: Guernsey, Holstein, Jersey, and Brown Swiss.

The Guernseys in our herd have never made so good a showing before. A year ago they ranked third in net profit, seven cows returning an average net profit of $41.66, which was $8.06 below the average net profit of seven Holsteins which ranked first. This year the Guernseys exceed the Holsteins in average net profit by $2.10.

The comparatively low production of the Jerseys will be clearly understood from what has already been said in the discussion of the herd records, at least, another glance at Table III will show that it has been an off-year for all Jersey cows with the exception of Double Time and Macella ranking second and third in net profit returned by cows of the herd. The one Brown Swiss cow ranks considerably above the average for the two cows of this breed which were in the herd a year ago.

WINTER RATIONS FED TO COWS, 1906–1907.

Owing to the cows receiving pasture in the summer, it is possible only in the winter to have accurate records of all feed consumed by the cows in the herd. For this reason special consideration is given the rations fed to the cows during the winter months. Thirty-four cows were included in the herd during the past winter, and each received daily in accordance with her capacity twenty-five to forty pounds of corn silage, about seven pounds of mixed hay and approximately as many pounds of grain daily as were produced pounds of butter fat per week. The principal grain ration consisted of wheat bran, oats, corn meal, and distillers' grains in the proportions of 3:3:2:2. Some oil meal and brewers' grains were fed in irregular quantities to supplement the regular grain ration where it was apparent a cow needed some variation in her feed. Analyses were made of the various feeding stuffs and these are given in the following table together with the digestible components of the feeds, which have been calculated by use of the digestion coefficients published by Jordan.

TABLE VI.—*Average composition of feeding stuffs fed to the University dairy herd, 1906-1907, in per cent.*

	Hay.	Silage.	Wheat bran.	Oats.	Corn.	Oil meal.	Distillers' grains.	Brewers' grains.
Moisture	10.66	74.45	10.42	12.25	15.61	9.65	5.58	7.84
Ether extract	1.21	.65	4.82	3.91	3.18	9.56	13.61	7.03
Crude protein	9.94	1.97	14.82	10.13	8.72	33.13	32.91	27.94
Fiber	36.26	5.69	9.92	14.83	1.83	7.95	13.67	14.53
Nitrogen-free extract	35.71	15.12	53.37	55.80	69.38	33.25	31.87	32.84
Ash	6.22	2.12	6.65	3.08	1.33	6.46	2.36	9.82
Dry matter	89.3	25.6	89.6	87.8	84.4	92.4	94.4	92.2
Digestible protein	5.7	1.0	11.5	7.8	6.6	29.4	24.4	22.2
Digestible carbohydrates and fat	46.1	15.4	47.7	52.5	71.6	50.7	62.8	42.0
Nutritive ratio, 1:	8.1	15.4	4.1	6.7	10.8	1.7	2.6	1.9

To study the relation between the feed eaten by the cows and their production of milk and butter fat, data for each of the thirty-four cows which were in the herd during the winter have been arranged in the table below. These data include the number of days from calving, the period they were dry, and the number of days they were in milk during the winter, the live weight, composition and average amount of dry matter in the ration fed and average amount of grain consumed per day, average daily production of milk and butter fat and the amount of dry matter and digestible protein consumed per pound of butter fat.

TABLE VII.—*Average winter rations fed to cows in University dairy herd, 1906–1907.*

NAME.	Days from calving.	Dry during winter period.	Days in milk. Nov. 14—May 16.	Live weight.	RATIONS FED.				Average grain per day.	AVERAGE DAILY PRODUCTION.			CONSUMED PER POUND OF BUTTER FAT.	
					Dry matter.	Digestible protein.	Digestible carbohydrates and fat.	Nutritive ratio.		Milk.	Butter fat.		Dry matter.	Digestible protein.
				Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Per ct.	Lbs.	Lbs.	Lbs.
Maxie	Dry.	Nov. 14–17	179	1,025	24.48	2.30	14.48	1:6.3	10.3	43.1	2.90	1.25	19.6	1.84
Masella	42		182	963	21.48	1.92	12.76	1:6.6	9.1	20.9	5.89	1.23	17.5	1.56
Christina	11		182	960	21.27	1.79	12.69	1:7.1	8.9	29.6	3.89	1.15	18.5	1.56
Merney*	Dry.	Nov. 14–24	153	949	21.36	1.67	12.66	1:7.6	8.2	29.6	3.85	1.14	18.7	1.46
Maggie	44		182	1,220	23.64	2.08	14.06	1:6.8	9.4	32.5	3.11	1.01	23.4	2.06
Jewel*	Dry.	Nov. 14–Dec. 2	164	882	18.52	1.68	10.96	1:6.5	8.0	17.5	5.77	1.01	18.3	1.66
Irma*	Dry.	Nov. 14–Jan. 29	104	988	20.78	1.79	12.23	1:6.8	8.0	24.1	4.15	1.00	20.8	1.79
Countess*	Dry.	Nov. 14–Dec. 29	137	911	17.29	1.48	10.22	1:6.9	6.9	21.4	4.49	.96	18.0	1.54
Johanna	342	Dec. 18–Feb 4	134	1,223	22.10	1.91	13.04	1:6.8	8.5	26.5	3.58	.95	23.3	2.01
Muriel	157		182	1,037	18.34	1.62	10.58	1:6.5	7.0	15.3	6.14	.94	19.5	1.72
McGeoch	Dry.	Nov. 14–Jan. 8	99	1,386	21.10	1.74	12.44	1:7.1	7.7	26.4	3.48	.92	23.0	1.80
Mollie	23		182	910	17.36	1.45	10.28	1:7.1	6.8	16.6	5.18	.86	20.2	1.69
Double Time	426		182	967	18.96	1.42	11.25	1:7.9	6.6	16.7	5.09	.85	22.3	1.67
Dorine	144		182	1,113	18.62	1.40	11.05	1:7.9	6.4	14.5	5.66	.82	22.7	1.71
Hannah	32		182	890	15.84	1.21	9.39	1:7.8	5.7	16.4	4.88	.80	19.8	1.51
Alma	247	Dec. 18–Feb. 4	134	1,127	21.75	1.72	12.96	1:7.5	8.0	27.3	2.93	.80	27.2	2.15
Queen	280		182	771	16.62	1.27	9.84	1:7.7	6.0	14.1	5.60	.79	21.0	1.61
Priscilla	287	Jan. 16–Feb. 20	147	916	18.46	1.72	10.92	1:6.3	7.6	17.4	3.97	.69	26.8	2.49
Marie	290	Dec. 31–Feb. 8	142	1,028	20.29	1.65	11.92	1:7.2	6.8	21.4	3.18	.68	29.8	2.43
Just in Time	130		182	924	17.37	1.24	10.27	1:8.3	5.4	11.7	5.38	.63	27.6	1.97
Sadie	85		182	927	15.99	1.16	9.43	1:8.1	5.0	13.5	4.67	.63	25.4	1.84
Ormsby	57		174	1,081	18.93	1.30	11.12	1:8.6	5.0	21.9	2.88	.63	30.0	2.06
Brownie	196		182	1,028	16.92	1.16	9.96	1:8.6	4.6	10.9	5.50	.60	28.2	1.98
Cozie	242		182	993	16.15	1.13	9.50	1:8.4	4.9	9.6	6.15	.59	27.4	1.98
Jeanette	251	Nov. 19–Mar. 7	74	1,135	17.14	1.35	10.02	1:7.4	5.2	15.3	3.86	.59	29.0	2.29
Floradora	195		182	1,118	17.10	1.21	10.10	1:8.3	5.0	10.2	5.69	.58	29.5	2.09
Josephine	193		182	1,237	21.21	1.61	12.38	1:7.7	5.2	18.5	3.14	.58	36.6	2.78
Perchance	57		182	986	15.97	1.07	9.36	1:8.7	3.8	13.2	4.40	.58	27.5	1.84
Adelaide	297	Jan. 23–Mar. 22	124	914	16.63	1.31	9.77	1:7.5	5.8	11.5	4.43	.51	32.6	2.57
Joe	201	Jan. 9–Apr. 10	91	1,270	19.28	1.38	11.33	1:8.2	5.1	12.7	3.78	.48	40.2	2.87
Broadway	249		182	1,017	14.23	.92	8.28	1:9.0	3.0	6.9	6.09	.42	33.9	2.19
Laura	202	Mar. 23–May 5	139	987	15.95	1.09	9.33	1:8.6	4.1	7.9	4.94	.39	40.9	2.79
Clara	209		182	1,235	17.88	1.16	10.44	1:9.0	4.0	9.6	4.06	.39	45.8	2.97
Artis	220	Feb. 13–Apr. 20	98	1,113	17.17	1.06	9.97	1:9.4	3.0	6.1	4.43	.27	63.6	3.93
Average (30 cows)	182†		160	1,050	18.61	1.45	10.96	1:7.6	6.1	17.3	4.16	.72	25.8	2.01

*Not included in average. †Six cows dry.

DISCUSSION OF WINTER RATIONS.

It will be noted in the preceding table that there was considerable variation in the cows as regards the number of days from calving at the beginning of the winter period, November 14, 1906. Eight cows had freshened within two months prior to this time, and six others were dry and freshened early in the winter, thus having an advantage in their production, over cows which were far advanced in lactation at the beginning and which did not freshen at all or else freshened late in the winter. The cows are arranged in the preceding table in the order of the average amount of butter fat per day produced and it is evident that with few exceptions the cows which freshened in the fall and early winter excelled over those which freshened earlier or later, both in the production of fat and in economy of their production.

The cows in the herd at the beginning of the winter period were advanced in their lactation an average of 182 days, six cows being dry. Double Time was 426 and four others over 200 days from calving at this time and did not freshen during the winter period. The cows gave milk 160 days, on the average, during the winter and produced an average of 17.3 pounds of milk and .72 pounds of butter fat per head daily for the whole period. The average test was 4.16 per cent. The average grain ration fed was 6.1 pounds and the total rations fed the cows averaged 18.6 pounds of dry matter, 1.45 pounds of digestible protein, and 10.96 pounds of digestible carbohydrates and fat, the nutritive ratio being 1:7.6.

Table IV, page 69, shows the changes in the live weights of the cows in the herd during the winter period. The weights of twenty-five of the cows included in the table were not affected by parturition, and of this number, eighteen gained, on the average, about thirty-eight pounds in weight and six lost an average of nearly twenty-eight pounds. Five of the cows which gained in weight were heifers and entitled to make a gain in body weight by growth. On the whole, however, it is quite evident that the tendency of the cows was to gain in weight under the system of feeding practiced during the past winter.

No attempt will be made at this time to draw conclusions on the relation of the rations fed during the past winter to the production of milk and butter fat. The feeding of rations comparatively wide in their nutritive ratios will be continued for at least another year and perhaps longer, when it is hoped sufficient data will have been accumulated to throw some light on the influence of the character of the rations on the producion of the cows, especially as to the effect of the nutritive ratio on the economy of production. On the whole, the cows average somewhat lighter in body weight than in previous years, due to the large number of heifers which are included. The number of pounds of dry matter fed in the rations is smaller, as is also the number of pounds of digestible protein. Only two cows received, on the average, more than two pounds of digestible protein daily during the winter period and nineteen cows received less than one and a half pounds.

The seven cows which averaged in production more than one pound of butter fat per day, consumed, on the average, 19.5 pounds of dry matter and 1.70 pounds of digestible protein for each pound of butter fat produced. The five cows which made, on the average, less than one half pound of butfat per day, consumed, on the average, 46.5 pounds of dry matter and 2.97 pounds of digestible protein per pound of butter fat produced. These figures emphasize the importance of having fall cows for profitable production of milk and butter fat during the winter, and in case cows are not fresh, the importance of exercising great care to feed them according to their production. Cows which are high producers can consume daily large amounts of dry matter, containing as high as two to three pounds of digestible protein and be expected to utilize their feeds economically, while cows which are advanced in lactation and are low producers should be fed less grain and feeds of a cheaper quality, if they are to yield any profit whatever.

TESTS OF DAIRY COWS 1906-1907.

F. W. WOLL AND ROY T. HARRIS.

The work of "testing" dairy cows, *i. e.,* securing authenticated records of their production of milk and butter fat for certain periods, has been in charge of the Department of Chemistry of this Station since 1899.* The work has gradually grown from year to year until it has now assumed considerable dimensions, more than a dozen men being employed on the tests during the winter period, which is the busiest season for this work, and a large share of the time of the writers is taken up with the administration of the tests.

The tests of dairy cows conducted by our Station are of two kinds, viz, so-called *official* and *semi-official* tests. The former are conducted for brief periods, mostly for seven consecutive days, and occasionally for thirty or sixty days, during which time a representative of the Station is present at every milking of the cows placed on the test, and is personally responsible for the correctness of the weights and the tests of the milk; both he and the owner of the cow are, moreover, required to make affidavits as to the accuracy of the data reported. The semi-official tests, on the other hand, are conducted for a period of one year, and are only official so far as the tests of two-days' duration conducted each month are concerned; the owner's detailed report on the monthly milk yields is checked up by the figures obtained on this test, and in other ways, and the average quality of the milk of the monthly tests is taken to represent that of the entire month for the cow tested. The sum of the figures for the production of milk and butter fat of a cow for twelve consecutive months, or for such part thereof during which she is in milk, gives the semi-official record of the cow for the year. While not absolutely accurate, the records secured by this arrangement are doubtless, as a rule, within a couple of per cent of the actual production of the cows for the year and may, therefore, be considered practically correct.

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* For a brief history of dairy tests in Wisconsin, see Bulletin 107 of this Station; for reports of work done in the past in this line, see Bulletins 10, 107, 131, and 134; Annual Reports *11*, p. 205; *13*, 64; *14*, 153; *15*, 30; *16*, 140; *17*, 62; *18*, 73; *19*, 107; *21*, 12.

Only a brief report of the work done in this line is included here, the plan being to publish a more detailed report in bulletin form in the near future, which will present a full account of the results obtained during the past year. The following table shows the number of dairy tests conducted during the year ending October 1, 1907, with the number of cows tested during this period and since 1893, when the work was first conducted in a systematic manner, through the establishment of the Advanced Register of the Holstein-Friesian Association of America, on the basis of officially authenticated records of the production of milk and butter fat by the cows.

TABLE I.—*Summary of tests conducted and of cows tested, 1893–1907.*

BREED.	1906–1907.			1893–1907.
	Number of tests.	Number of cows.	Total per breed.	Number of cows.
Holstein, two-day tests	147	29	233	1,655
seven-day tests	188	183		
thirty-day tests	21	21		
Guernsey, one-day tests	586	99	99	423
Jersey, two-day tests	10	5	6	129
seven-day tests	1	1		
Ayrshire, seven-day tests	3	3	3	3
Shorthorn, seven-day tests	....	....	....	12
Brown Swiss, seven-day tests	....	....	....	9
Red Polled, seven-day tests	....	....	....	34
Grades, one-day tests	13	4	4	39
Total	969	345	345	2,304

We note that 969 different tests were conducted during the past year, of 345 different cows. Of the number of tests given, 213 were official tests and 756 were one or two-day tests conducted for semi-official records. The total number of cows tested during the year was 345, the different breeds being represented as follows: Holsteins, 233 cows; Guernseys, 99; Jerseys, 6; Ayrshires, 3; and Grades, 4. During the past fifteen years when this work has been in progress we have tested in all over 2,300 cows, of which, 1,655 were Holstein cows, 423 Guernseys, 129 Jerseys, 39 Grades, 34 Red Polled, 12 Shorthorns, 9 Brown Swiss, and 3 Ayrshires. The reader is referred to the forthcoming bulletin for detailed information as to the results of tests made during the year; we shall here only refer to the more important features of the results obtained.

Tests of Holstein cows.—As in earlier years, the largest number of officially tested cows was of this breed, viz, 183 cows were tested for a period of seven consecutive days, and 21 cows were tested for one full month. Twenty-nine Holstein cows were tested semi-officially, *i. e.,* on yearly tests, and of these 13 completed records for yearly production. The official tests were conducted in coöperation with the Holstein-Friesian Association of America, while the semi-official tests were conducted independently by our Station, the records made being accepted and published by the Holstein-Friesian Association.

The highest records made by cows of this breed during the year were as follows:—

TABLE II.—*Production of Holstein cows on seven- and thirty-day official tests, 1906–1907.*

No.	NAME OF COW.	Herd book No.	Age.	SEVEN DAY RECORDS.			THIRTY DAY RECORDS.		
				Milk, pounds	Butter fat.		Milk, pounds	Butter fat.	
					Pounds	Per cent.		Pounds	Per cent.
			Y. M.						
1	Colantha 4ths Johanna..........	48577	8— 2	651.7	28.176	4.32	2,873.6	110.833	3.86
2	Oak De Kol 2d ..	66793	4— 2	580.9	19.655	3.38	2,436.8	80.774	3.31
3	Abbie Douglass De Kol 2d......	65690	3—11	447.1	16.678	3.73	1,888.6	68.129	3.61
4	Bessie De Kol Rue 2d.........	79374	2— 5	433.4	18.082	4.17	1,791.6	70.001	3.96
5	Jessie Fobes 6ths Violet 4th	83263	2— 0*	303.6	10.901	3.59	....	....	....
6	Canary Vevie De Kol.............	78636	2— 0†	....	....	....	1,243.4	44.077	3.54

* Age, 1 yr., 11 mo., 21 days (at beginning of test.)
†Age, 1 yr., 11 mo., 18 days (at beginning of test.)

These cows were owned by the following Wisconsin breeders: No. 3, by F. J. Bristol, Oakfield; No. 1, by W. J. Gillett, Rosendale; Nos. 2 and 5, by S. B. Jones & Son, Watertown; No. 6, by Reddelien Bros., North Lake; and No. 4, by C. A. Schroeder, West Bend.

Of the thirteen cows completing semi-official yearly tests during the year, seven had a production of 400 pounds of butter fat or more. The names and production of these cows with other data are given in the following table, in which the cows are placed in the order of their production of butter fat for the year:—

TABLE III.—*Semi-official yearly tests of Holstein cows, 1906-1907*.

No.	Name and H.-B. number.	Age.	Number of days reported.	Milk, pounds.	BUTTER FAT.	
					Pounds.	Per cent.
		Y. M.				
1	Johanna De Kol Wit, 61,874.....	4-1	365	16,176.4	626.145	3.87
2	Netherland Johanna De Kol 2d, 61,871....	4-5	365	17,698.3	590.458	3.34
3	Netherland Bessie, 35,997.........	13-8	365	13,085.2	518.506	3.96
4	Netherland Johanna De Kol 3d, 73,311......................... ...	2-6	365	13,658.0	443.230	3.25
5	Anna Clothilde, 25,384..	15-3	365	14,779.8	440.738	2.98
6	Johanna De Kol Lucy Wit, 74,293	2-2	365	12,139.7	421.766	3.47
7	Aagje Beck 6th, 38,797............	11-6	364	12,561.4	411.630	3.28

The owners of these cows were No. 4, F. W. Allis, Madison; No. 7, Reddelien Bros., North Lake; Nos. 1, 2, 3, 5, and No. 6, C. A. Schroeder, West Bend.

Tests of Guernsey cows.—All tests of Guernsey cows were semi-official and conducted in coöperation with the American Guernsey Cattle Club, the rules of which provide for one-day tests each month, instead of two-day monthly tests, as in the case of other semi-official tests conducted by our Station. It has been found, however, that the results obtained by the former method of procedure, while not quite so trustworthy as those obtained by conducting two-day tests each month, come very close to the actual production of the cows for a year, and may safely be taken as showing the value of the cows for dairy and breeding purposes. Twenty-two Guernsey cows completed annual records during the year; the eleven cows which produced more than 400 pounds of butter fat are given in the following table, with the main facts bearing on their records of production:—

TABLE IV.—*Semi-official yearly tests of Guernsey cows, December 27, 1906, to October 17, 1907.*

NAME.	Herd book No.	Advanced register No.	Age at beginning of test.	Milk, pounds.	BUTTER FAT.	
					Pounds.	Average per cent.
			Y. M.			
1. Yeksarose	16610	472	2-7	11,275.50	638.49	5.66
2. Peach O. K.	12994	554	6-9	11,683.50	603.64	5.17
3. Lily of Helendale	16915	537	2-9	11,401.00	600.49	5.27
4. Lily Berkshire 2d.	12970	555	7-6	11,028.50	571.87	5.19
5. Starlight of Geneva	9183	536	10-0	11,524.10	570.32	4.95
6. Rijolette	16611	483	2-7	11,622.30	548.25	4.71
7. Penthesilia	17625	550	2-3	9,922.40	539.07	5.43
8. Matinee	16916	520	2-6	9,381.70	524.98	5.60
9. Danusia	16917	514	2-5	10,013.60	508.90	5.08
10. Belle Brandon	5671	518	15-0	8,061.30	428.23	5.31
11. Countess Una	15819	570	4-1	7,489.00	413.30	5.52

The first nine cows given in the table are owned by the Rietbrock Estate, Athens, while cows Nos. 10 and 11 are owned by C. L. Hill, of Rosendale.

Tests of Jersey cows.—Five Jersey cows were placed on semi-official tests during the year and a single Jersey was tested for seven days. The former tests were conducted in conjunction with the American Jersey Cattle Club, and three of the cows tested qualified for the Register of Merit of this Club, with the production to their credit shown in the following table. All these cows were owned by F. H. Scribner of Rosendale. The results of the single seven-day test of the Jersey cow made during the year are given under the following heading. This cow was owned by J. Q. Emery & Son of Edgerton.

TABLE V.—*Production of Wisconsin Jersey cows admitted to Register of Merit, A. J. C. C., 1906-1907.*

NAME.	Herd book number.	Age.	Milk, pounds.	BUTTER FAT.	
				Pounds.	Average per cent.
		Y. M.			
1. Midget Petitesse	177,293	4 — 1	6,894.3	436.29	6.33
2. Pearl Villa	183,310	3 — 4	6,972.7	414.34	5.94
3. Pedro's Lucerne	183,217	3 — 3	8,692.7	398.14	4.58

Tests of Ayrshire cows.—Three Ayrshire cows, all in the University dairy herd, were tested officially during the year, the test being conducted under the supervision of Prof. W. J. Fraser, Head of the Department of Dairy Husbandry of the University of Illinois. The results of the tests may be seen from the following table:—

TABLE VI.—*Production of cows (Ayrshires and Jersey) on seven-day official tests, 1906-1907.*

Name.	Herd book number.	Age.	Milk, pounds.	BUTTER FAT.	
				Pounds.	Average per cent.
		Y. M.			
1. Jeanette S.	15,928	7 — 2	333.6	12.516	3.75
2. Priscilla S.	13.729	8 —11	277.5	10.740	3.87
3. Adelaide S	15,923	8 — 3	252.8	11.001	4.35
4. Pedro's Pandora	161.388	7 — 3	279.1	13.295	4.76

The rules under which the preceding and other dairy tests were conducted will be found in Bulletin 144 of our Station (pages 62–65). They were not materially changed during the year. The most important feature relating to the conduct of the tests during the year was that supervisors of dairy tests are now appointed by the Regents of the University from the eligible list furnished by the State Civil Service Commission, the candidates being placed on the list according to their standings in examinations held by the Commission. This gives further assurance, if need be, that the tests will be conducted in a fair and unbiased manner, so that the records made may be generally accepted by partisans of all breeds without a question.

The value of this system of testing dairy cows is not limited to the particular breeders for whom the work is done, but extends to wherever the cattle raised by these breeders are sold. The tests furnish breeders of dairy cattle with definite information as to the productive capacity of their cows, and thus enable them to plan their breeding operations systematically with the best possible assurance of success; and dairy farmers and buyers of dairy cattle are furnished authentic records as to the actual production of milk and butter fat by their cows for stated periods, and are thus placed in a position to judge definitely of the value of the cows tested, or of the progeny or near relatives of these, for their own herds. There can be no doubt but that these tests have been an important factor in the gradual improvement of dairy herds in the communities in which they have been conducted, and far beyond the limits of these communities. For the reasons stated and on account of the accurate data which the tests supply as to the production of many of the best dairy cows in our State, we are pleased to arrange for the conduct of such tests whenever called upon, to the extent that our facilities will permit. The evident trend of opinion among progressive dairymen and students of dairying is to the effect that tests conducted for a lactation period or an entire year are of the highest value for determining the capacity of a cow for dairy production, and for this reason we urge our breeders to make provisions for having such tests made, rather than for brief periods of a week or even a month.

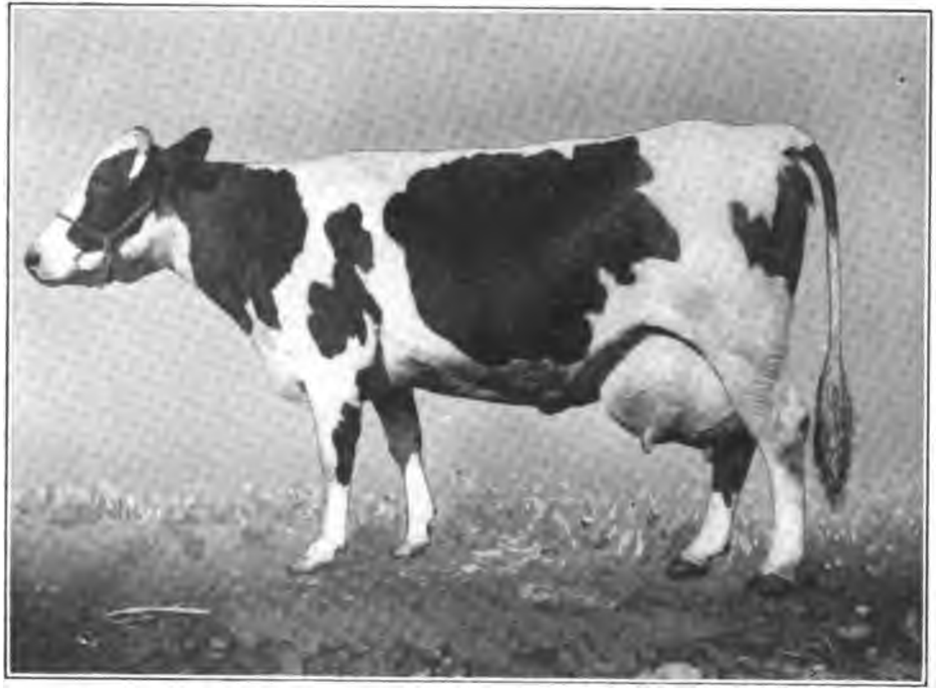

Fig. 16.—Colantha 4th's Johanna (H.—F. H. B., 48577).

Production during seven days, February 6-13, 1907: 651.7 pounds of milk and 28.176 pounds of fat (average test, 4.32 per cent).

Production during thirty days, January 21-February 20, 1907: 2873.6 pounds of milk and 110.833 pounds fat (average test, 3.86 per cent).

These records were made on official tests conducted by this Experiment Station

THE RECORDS OF PRODUCTION MADE BY COLANTHA 4TH'S JOHANNA (H.-F. H. B, 48577) 1906-1907.

F. W. WOLL.

No results of a dairy test conducted by this Station have created as much attention among dairy farmers and breeders throughout the country as did the records made last winter by the Holstein cow, Colantha 4th's Johanna. The production of butter fat by this cow during seven- and thirty-day tests exceeded by large margins the previous records of this or other dairy breeds, and the cow went through this test in excellent condition and commenced her work on a yearly semi-official test with results that gave promise of eclipsing also all previous records for annual production of butter fat; a promise which, at this writing (November, '07), she has fully kept. The fact that the cow produced during twenty-four hours (in four milkings) over four and one-half pounds of butter fat, equivalent to about five and one-third pounds of commercial butter, is one that entitles her production to a careful consideration, for no cow ever equalled this production or came near it by a pound or more, so far as is known to the writer; hence, the present article furnishing a detailed report on the production of the cow during the past year.

Colantha 4th's Johanna was dropped October 30, 1898, and was about 8 years 2 months old at the beginning of the tests here reported. She is the daughter of Colantha 4th (A. R. 1206, 19.6 pounds of butter fat in 7 days), her sire being Sir Johanna (No. 23446). She dropped her last calf on December

19, 1906, and was placed on an official test five days later, D cember 24. She had not been in calf for three years prior freshening this time, but gave milk up to a couple of weel of last calving. The care which she received at the hands her owner, feeder, and milker, Mr. W. J. Gillett, of Rosendal Wisconsin, was naturally such as would be conducive to a excellent production, and other conditions at the time of h test were also favorable to securing exceptional yields. T accompanying half-tone reproduction of the cow will be of i terest to dairy farmers and all students of dairying.

Official seven-day record.—The daily production of the co during the week when she gave her maximum yield of butt fat was as follows:—

TABLE I.—*Production of Colantha 4th's Johanna on seven-day offici test, February 6–13, 1907.*

Date.	Milk, pounds.	BUTTER FAT.	
		Per cent.	Pounds.
February 6-7	100.8	3.96	3.996
February 7-8	96.3	4.21	4.051
February 8-9	92 1	4.54	4.184
February 9-10	89.8	5.12	4 594
February 10-11	91.1	4.60	4.192
February 11-12	89.8	3.95	3.543
February 12-13	91.8	3.94	3.616
Total	651.7	4.32	28.176

This record of 28.176 pounds of butter fat is .717 pound higher than the corresponding record held during the precedin three years by the Holstein cow, Aaggie Cornucopia Paulin (48725, A. R. 1733); it is equivalent to a yield of 32. pounds of commercial butter for the week, or an average dail yield of butter of 4.7 pounds.

During the progress of this test the rations fed the cow wer composed as follows: 30 pounds silage, 35 pounds sugar beet 10 pounds clover hay, 21 pounds of a grain mixture, consistin of equal parts, by weight, of wheat bran, ground oats, an gluten feed, and 3 pounds of oil meal (O. P.). The compos tion of this ration calculated on the basis of average analyse is 42.6 pounds dry matter, 5.67 pounds of digestible protein, 25.8 pounds carbohydrates and fat; nutritive ratio, 1:4.6. The cow required therefore, for a production of 100 pounds of milk, 45.1 pounds of dry matter containing 6.0 pounds of digestible protein, and 33.3 pounds of total digestible matter. For one pound of butter fat she required 10.6 pounds of dry matter, 1.4 pounds of digestible protein, and 7.8 pounds total digestible matter. This shows an exceedingly economical production, since good dairy cows will require about 100 pounds of dry matter, 8.0 pounds of digestible protein, and 70 pounds of digestible matter for every 100 pounds of milk produced*, and excellent producers are able to lower this to about 90, 7.0, and 60 pounds, respectively. In the same way, the amount of food required for the production of one pound of butter fat for good dairy cows will be about 24, 1.8, and 16 pounds for dry matter, digestible protein, and total digestible matter, respectively, while for cows of high productive capacity, the corresponding figures will be about 20, 1.6, and 14 pounds.

The cow was kept in a box stall in a light and well-ventilated basement stable during the progress of the test and was blanketed after February 6. Her exact weight was not ascertained at the beginning or the close of the test, but so far as could be observed, she did not lose weight during the progress of the test, and was in good flesh the whole period; her good appetite, bright eye, and soft, glossy coat testified that she was in excellent condition and apparently not weakened by her heavy production during the preceding eight weeks.

Official thirty-day record.—The highest production of the cow for *thirty* consecutive days came January 21 to February 20, viz, 2,873.6 pounds milk and 110.833 pounds fat (average test 3.86 per cent), this amount of fat being .74 of a pound higher than the previous thirty-day record, held by Aaggie Cornucopia Pauline. Colantha 4th's Johanna was continued on the official test for sixty-three consecutive days, and during the sixty days, December 27 to February 24, made a record of 5,326.7 pounds milk containing 208.398 pounds fat (average fat content, 3.91 per cent). The latter production is at least twenty-five per cent higher than the average production of butter fat of cows of this or other states in the Union for an entire year, and gives her credit for an average daily yield for this period of 88.8 pounds of milk and 3.47 pounds of butter fat. The following table shows the production of the cow for each week of the official test of nine weeks.

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* Wis. Expt. Sta., Bul. 117, p. 5.

TABLE II.—*Production of Colantha's 4th's Johanna on official test, conducted for sixty-three days, December 24, 1906, to February 24, 1907.*

Date.	Milk, pounds.	BUTTER FAT.	
		Per cent.	Pounds.
December 24-30, 1906	478.4	4.40	21.044
December 31-January 6, 1907	533.0	4.18	22.254
January 7-13, 1907	560.0	3.98	22.258
January 14-20, 1907	603.3	3.83	23.103
January 21-27, 1907	646.3	3.85	24.885
January 28-February 3, 1907	670.2	3.75	25.152
February 4-10, 1907	668.2	4.10	27.823
February 11-17, 1907	684.0	3.73	25.514
February 18-24, 1907	686.2	3.67	25.171
Total for 63 days	5,529.6	3.93	217.207

The official test was conducted by two of our regular supervisors of dairy tests, viz, up to February 3, by R. N. West of Ripon, Wisconsin, and from that date to the end, by R. C. Walker of Plainville, Wisconsin. Two retests or duplicate tests were conducted, viz, for twenty-four hours, on January 9, by Mr. Roy T. Harris, Assistant in Dairy Tests, and for forty-eight hours, February 11 to 13, by one of our regular supervisors, E. A. Beule of Fox Lake, Wisconsin. The production of the cow during these two periods was determined independently by these parties and the supervisor in charge of the test at the time, with results that corroborated the figures obtained on the official test. During the periods stated, the cow was watched day and night by one or the other of the supervisors detailed on the test. During the first day of the second duplicate test, the writer was also present at the farm and satisfied himself that all weighings and tests made by the supervisors were correct, and that no irregularities occurred during this period in the feeding or the handling of the cow.

During the time Colantha 4th's Johanna was on the official test, she also had the highest authenticated production of butter fat for a day on record, viz, as previously stated, 4.594 pounds, on February 9 to 10. She was milked four times a day at that time, viz, at 5 A. M. and P. M., and at 11 A. M. and P. M. Her record for this period is shown in the following table:—

TABLE III.—*Production of Colantha 4th's Johanna, highest production of butter fat for one day, February 9-10, 1907.*

Time of milking,	Milk, pounds.	BUTTER FAT.	
		Per cent.	Pounds.
5 p. m	24.0	4.78	1.147
11 p. m	21.7	5.0	1.085
5 a. m	25.2	5.1	1.285
11 a. m	18.9	5.7	1.077
Total	89.8	5.11	4.594

The milk yield on that date was not, however, her maximum production for twenty-four consecutive hours, but this came during the following week, viz, February 16 to 17, with 106.0 pounds, containing 3.637 pounds butter fat, average test 3.43; the separate milkings being 25.0, 28.7, 24.3, and 28.0 pounds, testing 3.3, 2.9, 4.0, and 3.6 per cent, respectively.

Semi-official record.—The owner decided to enter the cow on a semi-official yearly test on the expiration of the sixty-three day official test, and during the past year, she has been tested for two consecutive days once every month, in the regular rounds of our supervisors to the farms on which these tests have been conducted; up to the present time, she has been on this test for ten months and nine days and has received a total credit for this period amounting to 23,981.4 pounds milk, and 875.71 pounds butter fat, average fat content 3.65 per cent.

According to present prospects, she will produce nearly one thousand pounds butter fat for the year, or sixteen per cent higher than the record for annual production of butter fat now held by the Guernsey cow, Yeksa Sunbeam.*

It is apparent, therefore, that the remarkable performance of the cow during the official tests conducted at the beginning of the lactation period has been continued up to the present time and will probably continue beyond the close of the year ending December 22, 1907, and establish a record for the production of butter fat for a year that will be likely to show the maximum productive capacity of dairy cows for years to come and will always be considered a striking testimony of the wonderful development of the modern dairy cow.†

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* See Wis. Bul. 131, p. 39.

† During the year ending December 22, 1907, this cow produced on a semi-official test 27,432.5 pounds of milk, 998.26 pounds of butter fat, (average test, 3.64 per cent).

FEEDING STUFF INSPECTION IN WISCONSIN, 1907.

F. W. WOLL.

In accordance with the provisions of the Wisconsin feeding stuff law (Chap. 377, laws of 1901) ninety-six different brands of concentrated commercial feeding stuffs were licensed for sale in this State for the calendar year ending December 31, 1907, by 68 different manufacturers or agents. The names of the different licensed brands, and the guarantees for protein and fat under which they were sold, with the names and addresses of the parties in whose names the licenses were issued, are shown in the following table:—

TABLE I.—*Licensed commercial feeding stuffs, 1907.*

No	Name of brand.	Manufacturer or agent.	GUARANTEE.	
			Protein.	Fat.
	OIL MEALS.		Per ct.	Per ct.
1	**Ground Linseed Cake**	Wm. Goodrich & Co., Milwaukee.	32.0	5.0
2	**Ground Oil Cake**	Minn. Linseed Oil Co., Minneapolis	34.0	5.0
3	**Ground Oil Cake**	Northern Linseed Oil Co., Minneapolis	32.0	6.0
4	**Ground Linseed Cake**	American Linseed Co., Minneapolis	32.0	5.0
5	**O. P. Ground Oil Cake**	Red Wing Linseed Mills, Red Wing, Minn.	32.0	6.0
6	**Midland Brand O. P. Ground Linseed Cake**	Midland Linseed Co., Minneapolis	30.0	5.5
7	**Pure Old Process Oil Meal**	Archer-Daniels Linseed Co, Minneapolis	33.0	6.0
	GLUTEN FEEDS, CORN FEEDS, ETC.			
8	**Continental Gluten Feed**	Continental Cereal Co., Peoria	33.0*	14.0*
9	**Ajax Flakes**	Chapin & Co., Milwaukee	30.0	12.0
10	**Buffalo Gluten Feed**	Corn Products Mfg. Co., Chicago	24.0	2.5
11	**Cedar Rapids Gluten Feed**	Douglas & Co., Cedar Rapids, Iowa	21.0	4.0

* On dry basis.

TABLE I.—*Licensed commercial feeding stuffs, 1907*.—Continued.

No.	Name of brand.	Manufacturer or agent.	GUARANTEE.	
			Protein.	Fat.
			Per ct.	Per ct.
12	**Eagle Hominy Feed**	John B. A. Kern & Sons, Milwaukee	10.75	7.5
13	**"Success" Hominy Feed**	Deutsch & Sickert Co., Milwaukee	11.0	7.0
14	**Standard Hominy Feed**	Robt. Krull Com. Co., Milwaukee	11.9	8.0
15	**Yellow Hominy Feed**	E. S. Woodworth & Co., Minneapolis	11.19	8.26
	MIXED CORN AND OAT FEEDS.			
16	**Blue Cross Corn & Oats Feed**	E. P. Doty, Janesville, Wis.	7.0	3.0
17	**Schumacher Stock Feed**	The Quaker Oats Co., Chicago	11.0	4.0
18	**Victor Feed or "C" Feed**	The Quaker Oats Co., Chicago	7.5	3.0
19	**Quaker Dairy Feed**	The Quaker Oats Co., Chicago	12.0	3.0
20	**Vim Feed, or "X" Feed**	The Quaker Oats Co., Chicago	5.5	2.0
21	**Excelsior Chop Feed**	The Great Western Cereal Co., Chicago	8.0	3.5
22	**Royal Oat Feed**	The Great Western Cereal Co., Chicago	6.6	2.5
23	**Hominy Mixed Feed**	Peter Schmitz & Son, Milwaukee	9.05	5.66
24	**Imperial Corn and Oat Feed**	Deutsch & Sickert Co., Milwaukee	8.0	4.0
25	**Yellow OO Feed**	E. S. Woodworth & Co., Minneapolis	9.39	5.02
26	**C. & O. Feed**	Peru Milling Co., Peru, Ill.	7.0	4.0
	MISCELLANEOUS DAIRY FEEDS.			
27	**Blatchford's Calf Meal**	J. W. Barwell, Waukegan, Ill.	25.0	5.0
28	**Blatchford's Sugar & Flaxseed**	J. W. Barwell, Waukegan, Ill.	27.0	10.0
29	**National Calf Food**	National Food Co., Fond du Lac, Wis.	17.25	2.0
30	**Dr. Wasem's XXXX Calf Meal**	Cuba City Remedy Co., Cuba City, Wis.	36.0	15.0
31	**Martin's Calf Feed**	John C. Martin & Co., Mineral Point, Wis.	26.0	10.0
32	**Premium Calf Meal**	The Quaker Oats Co, Chicago	11.5	4.5
33	**Schumacher Calf Meal**	The Quaker Oats Co., Chicago	19.0	8.0
34	**Hammond Dairy Feed**	Western Grain Products Co., Milwaukee	17.0	3.0
35	**Daisy Dairy Feed**	The Great Western Cereal Co., Chicago	16.0	3.0
36	**Badger Dairy Feed**	Chas. A. Krause Milling Co., Milwaukee	18.0	4.5*
37	**Mueller's Molasses Grains**	E. P. Mueller, Milwaukee	1.0	1.0
38	**Superior Quality Dried Brewers' Grains**	John Gund Brewing Co., La Crosse	25.0	7.0
39	**Dried Grains**	Pabst Brewing Co, Milwaukee	23.24	7.33
40	**Schlitz Dried Grains**	M. G. Rankin & Co., Milwaukee.	28.0	7.0
41	**Dried Brewers' Grains**	E. P. Mueller, Milwaukee	26.0	6.0
42	**Malt Sprouts**	Horlick's Malted Milk Co., Racine	25.0	1.0

*On dry basis.

TABLE I.—*Licensed commercial feeding stuffs, 1907*—Continued.

No.	Name of brand.	Manufacturer or agent.	GUARANTEE. Protein.	GUARANTEE. Fat.
	MISCELLANEOUS—continued.		Per ct.	Per ct.
43	**Malt Sprouts**	Borchert Malting Co., Milwaukee	26.75	.86
44	**Malt Sprouts**	C. & J. Michel Brg. Co., La Crosse	27.0	.7
45	**Malt Sprouts**	Fauerbach Brg. Co., Madison	28.5	.7
46	**Malt Sprouts**	Fred Miller Brg. Co. Milwaukee.	25.98	1.46
47	**Malt Sprouts**	The Storck Brg. Co., Schleisingerville, Wis	22.0	1.
48	**Malt Sprouts**	John Walter & Co., Eau Claire, Wis	26.0	1.3
49	**Malt Sprouts**	Wisconsin Malt and Grain Co., Appleton, Wis	26.5	.7
50	**Malt Sprouts**	A. G. Laubenstein, Hartford, Wis.	25.0	.75
51	**Malt Sprouts**	The Kurth Co., Columbus, Wis	24.0	.6
52	**Malt Sprouts**	American Malting Co., Milwaukee, Wis	23.0	1.25
53	**Malt Sprouts**	Portz Bros., Hartford, Wis	25.0	.75
54	**Malt Sprouts**	Pabst Brg. Co., Milwaukee, Wis.	30.39	1.7
55	**Malt Sprouts**	Konrad Bros. & Werner, Hartford, Wis	26.5	.6
56	**Malt Sprouts**	Henry Rahr Sons' Co., Green Bay, Wis	30.0	.6
57	**Malt Sprouts**	Rubicon Malting & Gr. Co., Rubicon, Wis	21.0	.85
58	**Malt Sprouts**	Froedtert Bros. Gr. & Malting Co., Milwaukee.	27.5	1.80
59	**Malt Sprouts**	The Konrad Schreier Co., Sheboygan, Wis	25.5	1.0
60	**Malt Sprouts**	Rudolf Heger, Jefferson, Wis	27.5	1.8
61	**Malt Sprouts**	The Oshkosh Brg. Co., Oshkosh, Wis	27.0	1.7
62	**Malt Sprouts**	G. Heileman Brg. Co., La Crosse	30.0	1.0
63	**Beef Scraps**	The Armour Fertilizer Works, Chicago	55.0	12.0
64	**Meat Meal**	The Armour Fertilizer Works, Chicago	50.0	10.0
65	**Poultry Bone**	The Armour Fertilizer Works, Chicago	24.0	.5
66	**Blood Meal**	The Armour Fertilizer Works, Chicago	85.0	.2
67	**Swift's Digester Tankage**	Swift & Co, Chicago	60.0	8.0*
68	**Swift's Blood Meal**	Swift & Co., Chicago	87.0	....
69	**Swift's Beef Scraps**	Swift & Co, Chicago	55.0	10.0
70	**Swift's Poultry Bone**	Swift & Co., Chicago	25.0	†
71	**Blatchford's Fill the Basket Poultry Meats**	J. W. Barwell, Waukegan, Ill	33.0	10.0
72	**Jewel Chick Feed**	International Stock Food Co., Minneapolis	12.25	2.7
73	**Globe Scratch Feed**	The Albert Dickinson Co., Chicago	10.5	3.0
74	**Crescent Chick Feed**	The Albert Dickinson Co., Chicago	10.5	3.0
75	**Sun Chick Starter**	The Albert Dickinson Co., Chicago	10.5	3.0

* 6 per cent phosphates. † 55 per cent phosphates.

TABLE I.—*Licensed commercial feeding stuffs, 1907*—Continued.

No.	Name of brand.	Manufacturer or agent.	GUARANTEE.	
			Protein.	Fat.
	MISCELLANEOUS—continued.		Per ct.	Per ct.
76	**Queen Poultry Mash**	The Albert Dickinson Co., Chicago	11.0	4.0
77	**King Pigeon Feed**	The Albert Dickinson Co., Chicago	10.5	3.0
78	**Old Gold Poultry Food**	L. L. Olds Seed Co., Clinton, Wis.	10.5	3.0
79	**Old Gold Chick Food**	L. L. Olds Seed Co., Clinton, Wis,	10.5	3.0
80	**F. P. C. Chick Manna**	F. P. Cassel, Lansdale, Pa ; Wernich Seed Co., Agents, Milwaukee	12.0	4.0
81	**Wernich's Magic Chick Feed**	Wernich Seed Co., Milwaukee	12.0	5.4
82	**Chamberlain's Perfect Chick Food**	Wernich Seed Co., Milwaukee	10.69	3.06
83	**Scratching Food**	Cypher's Incubator Co , Buffalo, N. Y	11.05	3.0
84	**Chick Food**	Cypher's Incubator Co., Buffalo, N. Y	10.54	3.4
85	**Laying Food**	Cypher's Incubator Co.. Buffalo, N. Y	17 31	3.8
86	**Forcing Food**	Cypher's Incubator Co., Buffalo. N. Y.	12.89	3.8
87	**Developing Food**	Cypher's Incubator Co., Buffalo, N. Y.	10.0	3.72
88	**Sterling Hen Feed**	Northrup, King & Co., Minneapolis	11 .67	3.42
89	**Sterling Chick Food**	Northrup, King & Co., Minneapolis	12 25	2.7
90	**Extra Quality Quick Meal Chick Feed**	Steinmesh & Co., St. Louis; Kneisler Bros., Milwaukee, Agents	12.6	3.1
91	**Purina Mill Feed**	Ralston Purina Co., St. Louis	11.0	3.6
92	**Good Luck Chick Feed**	Good Luck Mills, St. Louis	9.0	3.0
93	**Feed-well Chick Feed**	Illinois Feed Mills, St. Louis	9.0	3.0
94	**Richelieu Brand Chick Feed**	Sprague-Warner & Co., Chicago	10.5	2.67
95	**Sterling Chick Feed**	The Great Western Cereal Co., Chicago	12.0	3.5
96	**Vaughan's Zenith Hen Food**	Vaughan's Seed Store, Chicago	8.0	2.0

Samples of concentrated commercial feeding stuffs offered for sale in the feed stores in this State were taken throughout the year by representatives of the Station. The inspection of the feed stores and the sampling of concentrated feeding stuffs during the past year were made by Messrs. Roy T. Harris and Chas. S. Knight, Assistants in the Chemical Department; the writer had charge of the office and laboratory work connected with the feed inspection, while the analyses of nearly all feed samples were made by Mr. George A. Olson, Assistant Chemist, or by Mr. Knight. The inspections of feed stores began on January 1, 1907, and were continued with intervals throughout the year. Three hundred and ninety-three feed stores in 101 villages or cities in the State were visited during the year. The stores in some of these places were inspected a number of times, as, for instance, Milwaukee, six times, Waukesha, four times, and eighteen cities or towns were visited two or three times.

Two hundred and three samples of concentrated feeding stuffs were collected in all, which were analyzed in our chemical laboratory. In addition to these, thirty-three samples of feeding stuffs were forwarded for examination by farmers or dealers and analyzed, making a total of 236 samples of concentrated feeding stuffs that were analyzed during the year.

The detailed results of the analyses of the samples of licensed feeding stuffs collected by us or furnished by farmers or dealers during the past year, will be published in a forthcoming bulletin of this Station, in which will also be given tables showing analyses of a number of samples of different feeds coming under the state feeding stuff law, that for various reasons had not been licensed for sale in this State, as well as a number of analyses of feeds that are not subject to license under the law.

An amendment to our state feeding stuff law, which was passed by the legislature of 1907 and which goes into operation with the beginning of next year, will greatly widen the scope of the law, since it provides for including under its provisions, in addition to the feeds specifically mentioned in the original law, all flour-mill and brewery feeds, and mixed feeds of whatever origin, except that feeds of the former class may be sold locally, direct to consumers, without having been licensed for sale. This places all manufacturers of concentrated feeding stuffs doing business in this State, whether residents of the State or not, on an equal footing, with the exception of small millers and maltsters whose output is not sufficiently large to enable them to take out licenses for their feeds, whose business is conducted under conditions that permit of easy supervision, and whose feeds are moreover well-known to all feed buyers, and cannot therefore be readily adulterated. The state feed law, as amended, is given in full at the close of this report.

INSPECTION OF COMMERCIAL FERTILIZERS, 1907.

F. W. WOLL.

The following statement gives the names of twenty-three different brands of commercial fertilizers licensed for sale in this State during the current year, in accordance with Wisconsin statutes of 1898, sec. 1494c; the names and addresses of the respective manufacturers and the guarantees for valuable fertilizer ingredients under which the brands were registered and sold in this State, will also be found in the table.

TABLE I.—*Licensed commercial fertilizers, 1907.*

No	Name of brand.	Manufacturer or agent.	Guarantee, per cent.			
			Nitrogen.	Phosphoric acid.		Potash.
				Available.	Total.	
			Pr. ct.	Pr. ct.	Pr ct.	Pr ct.
1	**Swift's Superphosphate**	Swift & Co., Chicago	1.64	8.0	12.0	2.0
2	**Swift's Onion, Potato and Tobacco**	Swift & Co., Chicago	1.64	8.0	11.0	7.0
3	**Swift's Pure Bone Meal**	Swift & Co., Chicago	2.50	......	25.0	......
4	**Swift's Truck Grower**	Swift & Co., Chicago	.82	8.0	10.0	4.0
5	**Swift's Sugar Beet Grower**	Swift & Co., Chicago	2.50	8.0	11.0	5.0
6	**Swift's Special Phosphate and Potash**	Swift & Co., Chicago	......	10.0	11.0	2.0
7	**Swift's Pure Ammoniated Bone and Potash**	Swift & Co, Chicago	4.75	......	16.0	3.0
8	**Homestead, a Bone Black Fertilizer**	Michigan Carbon Works, Detroit, Mich.	2.06	8.0	9.0	1.5
9	**Red Line Phosphate with Potash**	Michigan Carbon Works, Detroit, Mich.	......	10.0	11.0	2.0

TABLE I.—*Licensed commercial fertilizer, 1907*—Continued.

No.	Name of brand.	Manufacturer or agent.	GUARANTEE, PER CENT.			
			Nitrogen.	Phosphoric acid.		Potash.
				Available.	Total.	
			Pr. ct.	Pr. ct.	Pr. ct.	Pr. ct.
10	**Homestead High Grade Garden and Vegetable Fertilizer**	Michigan Carbon Works, Detroit, Mich.	2.06	8.0	9.0	6.0
11	**Blatchford's Plant Grower and Land Renovator**	John W. Barwell, Waukegan, Ill.	5.00	5.25	10.5	6.0
12	**Star Phosphate**	The Armour Fertilizer Works, Chicago	....	14.0	16.0	....
13	**All Soluble**	The Armour Fertilizer Works, Chicago	2.88	8.0	10.0	4.0
14	**Phosphate and Potash**	The Armour Fertilizer Works, Chicago.	....	10.0	12.0	2.0
15	**Bone, Blood, and Potash.**	The Armour Fertilizer Works, Chicago.	4 11	8.0	10.0	7.0
16	**Carrie's Complete Garden and Lawn Fertilizer**	Carrie Bros. Co., Mi'kee	5.13	3.28	12.07	7.88
17	**Darling's Western Brand.**	Darling & Co., Chicago.	.41	7.0	9.0	.5
18	**Darling's Chicago Brand.**	Darling & Co, Chicago.	1.65	8.0	10.0	2.0
19	**Darling's Farmer's Favorite Brand**	Darling & Co., Chicago.	2.47	8 0	10.0	4.0
20	**Darling's Vegetable and Lawn Fertilizer**	Darling & Co, Chicago.	3.3	8.0	9.0	7.0
21	**Swift's Garden City Phosphate**	Swift & Co., Chicago	....	14.0	15.0	....
22	**Swift's High Grade Special Phosphate and Potash**	Swift & Co., Chicago	......	10.0	11.0	4.0

The Station analyses of the licensed brands of commercial fertilizers for 1907 will be found in our bulletin 149. Only a few additional samples of fertilizers have been analyzed since the publication of this bulletin. These analyses will be given in the next fertilizer bulletin which will be published on or before the first day of April, 1908, in compliance with sec. 1494d, of the state fertilizer law.

CONDIMENTAL STOCK FOODS.*

F. W. WOLL.

The condimental stock foods and all preparations of similar composition sold under a variety of names, are mixtures of some well-known feed materials, like mill feeds, corn meal, oil meal, etc., and a number of simple herbs, roots, and barks that possess, or are supposed to possess, medicinal properties; common salt, Epsom salt, sulfur, charcoal, or coloring matters are also added in most cases, to increase the palatability or claimed medicinal effect of the food, or to disguise its composition. Stock foods are, therefore, supposed to act as condiments or medicines, and are not foods proper. As is well known, specific claims for nutritive properties are not made for any stock foods sold in this state, and we note, therefore, at this point, that they are sold through misrepresentation, under a false name, and with directions for feeding the same which show the claim to be false.

THE SALE OF STOCK FOODS IN THE STATE.

In order to obtain some definite knowledge in regard to the amount of business done by manufacturers of stock foods in our State, a thorough survey was made last year in three counties in the State that may be considered representative, viz: Walworth, Fond du Lac, and Trempealeau counties. All feed stores, grocery and general merchandise stores, drug stores, agricultural implement warehouses, blacksmith shops, creameries and other places where we had reason to believe stock foods were sold, were visited and the amounts of sales during the year in this class of goods were ascertained as accurately as possible. It is believed that the statistics gathered are, on the whole, quite satisfactory and sufficiently accurate for the purpose in view. The following statement shows the summary figures obtained.

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* **Summary of Bul. 151 of this Station.**

Value of the stock foods sold during the year.

Walworth County	$ 4,214 50
Fond du Lac County	3,714 60
Trempealeau County	3,273 60
Total	$11,202 70

If we assume that the total rural population of these counties is about 7,500 and that of the State 2,236,000 (Census of 1900), and that stock foods are sold in other parts of the State to a similar extent as in the counties mentioned, we find that the sales of these goods by feed dealers, etc., in our State in the aggregate amount to about $184,000 a year. A varying amount of business is also done by firms outside of the State, who sell directly to farmers, and by traveling agents, who visit certain localities at regular intervals and peddle patent medicines, condimental stock foods, and extracts. It is impossible to say definitely how much money is paid out by our farmers through these two channels, but from the information gathered, we believe it may be safely estimated at least at one-half as much again as sold by local dealers and agents; thus bringing the sum total paid out annually by the farmers of our State for stock foods up to about $300,000.

The retail prices of stock foods vary considerably, from a few cents to twenty-five cents a pound. Ten cents a pound is an average estimate, which certainly is not unjust to the dealers; that is, the $300,000 paid out by Wisconsin farmers represent something like 3,000,000 pounds, or 1,500 tons of stock

TABLE I.—*Chemical composition of stock foods.*

Lab. No.	Brand.	Manufacturer.	Dealer or agent.	Moisture.	Protein.	Fat.	Fiber.	Nitrogen, free extract	Ash.	Sulfur.
				er ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
1454	Alliance Stock Food....	Alliance Stock Food Co., Poynette, Wis.	Burton, Dennison & Davidson, Lake Geneva.	5.95	33.75	.32	9.98	32.66	17.34	....
1423	Ashland Stock Food...	Ashland Stock Food Co., Ashland, O....	E. A. Peterson, Walworth..	12.15	8.06	1.45	15.78	47.83	14.73	....
1425	Baum's Horse and Stock Food.	Baum's Castorine Co., Syracuse, N. Y...	E. J. Pett, Elkhorn...	9.28	22.50	3.30	19.93	31.25	10.38	3.36
1442	Booth's Dairy Food.....	Booth' Mfg. Co., La Crosse...	Manufacturer..............	11.66	20.50	6.04	6.48	28.66	16.66	....
1444	Booth's Stock Food.....	Booth Mfg. Co., La Crosse..............	C. A. Kellman, Galesville...	10.53	16.50	1.37	4.09	34.68	32.83	....
1449	Capitol Stock Food....	Capitol Stock Food Co., Tiffin, O........	D. L. Lawrence, Lyons.....	3.75	14.38	4.54	11.31	46.74	19.28	....
1419	Clover Brand Stock Food	Stock Food Co. of America, Minneapolis	J. S. Pierson & Son, Trempealeau.	10.79	2.25	2.62	28.86	33.50	19.10	2.88
1447	Columbian Stock Food..	Columbian Stock F'd Co., Detroit, Mich.	Utter Drug Co., F'd du Lac	3.91	13.31	3.52	8.91	49.64	20.33	.38
1453	Deitz' Stock Food.	Deitz Stock Food Co., Milwaukee....	L. C. Porter, Fontana.	4.01	18.13	5.06	9.44	53.86	9.50	.... .
1445	O. J. Doolan's Veterinary Stock Food.	O. J. Doolan, Fond du Lac.....	Manufacturer....	6.93	19.06	7.63	7.76	45.86	12.76	....
1422	Fleck's Stock Food.....	J. J. Fleck, Tiffin, Ohio.................	D. L. Glover, Delavan.	11.41	14.56	3.52	7.48	52.01	8.80	2.19
1438	Gold Coin Cattle Fattener.	Gold Coin Stock Food Co., Chicago.....	Chas. Pieplow, Elkhorn....	8.94	11.25	2.86	8.04	47.13	21.32	.46
1428	Gold Coin Hog Fattener	Gold Coin Stock Food Co., Chicago.....	Burlington Pharmacy, Burlington.	8.65	20.88	3.25	9.43	33.01	21.95	2.83
1418	Dr. Hess' Poultry Pan-a-ce-a.	Dr. Hess & Clark, Ashland, O....	E. J. Pett, Elkhorn.........	8.25	11.31	1.17	4.59	40.90	33.58	.20
1427	Dr. Hess' Stock Food...	Dr. Hess & Clark, Ashland, O	W. F. Fernholz, Delavan...	11.72	12.69	2.14	12.77	35.04	25.64	....
1443	Imperial Stock Food....	Imperial Chem. & Stock Food Co., Milw	L J. Judson, Delavan......	6.20	22.94	4.58	8.40	44.41	13.47	....
1448	International Stock Food.	International Stock Food Co., Minneapolis.	J. V. Itzin, Burlington......	4.27	13.06	3.80	11.74	47.24	19.89	....
1426	Leithhead's Live Stock Food.	L. W. Leithhead Drug Co., Duluth.....	Robbe Bros. & Dahl, Strum	11.86	15.88	4.66	8.02	51.28	5.30	....
1441	National Poultry Food..	National Food Co., Fond du Lac	Manufacturer........	7.75	13.31	2.32	7.02	38.30	31.30	....
1439	National Stock Food ...	National Food Co., Fond du Lac........	Burgett Bros., Genoa Jct ...	7.39	16.00	3.15	8.85	40.69	15.14	2.87
1421	Great Northwestern Stock Food........	Great Northwestern Stock Food Co., Manley, Ia.	L. A. Hanson, Trempealeau	9.96	12.56	2.81	3.42	42.33	28.92	....
1446	Pike's Tonic Stock Food	R. A. Pike & Co., Minneapolis	John Carson, Osseo	9.56	13.63	4.28	9.44	44.93	16.44	1.72
1424	Pratt's Food for Horses and Cattle.	Pratt Food Co., Chicago.	R. A. Young, Darien........	8.56	14.81	6.15	5.37	59.65	5.46	.. ....
1452	Prussian Stock Food....	Prussian Remedy Co., St. Paul.........	Pfeil & Kremer, F'd du Lac.	4.29	16.13	4.02	7.18	51.66	14.00	2.71
1420	Rawleigh's Imperial Stock Food.	W. T. Rawleigh Medical Co., Freeport, Ill.	Albert Koons, Elkhorn.... .	12.30	15.13	3.75	14.33	46.49	8.00	....
1437	Rawleigh's Poultry Powder.	W. T. Rawleigh Medical Co., Freeport, Ill.	Albert Koons, Elkhorn......	4.13	18.75	3.24	....	16.94*	49.17	7.77
1451	Sanford's Magic Egg Producer.	D. L. Lawrence, Lyons, Wis............	Manufacturer....	4.37	52.38	.72	14.13	18.59	18.65	1.10
1450	Tri-State Stock Food....	Tri-State Stock Food Co., Indianapolis.	Paul F. B ulay, F'd du Lac	2.93	11.88	2.72	8.47	42.60	31.40	....
1429	We-No-Na Stock Food.	Gerlicher Bros., Winona, Minn..	Larson & Melby, Eleva.....	7.62	12.06	6.21	13.85	48.27	11.55	.44
1440	Wilbur's Stock Food....	Wilbur Stock Food Co., Milwaukee. ..	Bayer Bros., East Troy ...	6.58	16.13	4.40	9.20	52.16	11.53	.... .

*Undetermined

foods. The query naturally suggests itself, "Is this a wise expenditure of money, or would not 1,500 tons of a standard feeding stuff, like oil meal, gluten feed, or wheat bran, produce as good results when fed to stock, thereby saving the farmers of our State over a quarter of a million dollars annually?" We shall not at this point anticipate the answer to this question, but would ask the reader to answer it for himself, as he follows the discussions presented below.

ANALYSES OF STOCK FOODS.

Samples of stock foods found in the feed stores and other stores in the three counties mentioned were collected by Mr. Roy T. Harris, Assistant in feed inspection, and have been analyzed in the chemical laboratory of our Station by Mr. Geo. A. Olson, Assistant Chemist; the results of analyses are shown in Table I.

Since the manufacturers do not claim that their "foods" possess any nutritive value, it will not be necessary to discuss here the results of the chemical analyses given in the preceding table. We wish to call attention, however, to two points in this connection: *First*, the high ash content of most of the materials, ranging from 5 to nearly 50 per cent, owing to the presence therein of large quantities of inorganic materials like common salt, Epsom and Glauber salts, lime carbonate and sulfate, iron sulfate, etc.; common salt is the most important of these components, and is present in by far the largest quantities, (see p. 105). *Second*, the protein contents of these "foods" range from 2.25 per cent (Clover Brand, being made up largely of ground pine bark, (see p. 105) to 52.38 per cent (Sanford's Magic Egg Producer). Most of the stock foods do not contain more valuable food materials than oil meal or even wheat bran, and many contain less, as might be expected when we consider the character of the materials entering into the composition of these "foods." However, since no special claims are made for nutritive properties in the stock foods, this fact is not very important, and their value must be decided on the basis of the medicinal properties of the drugs contained therein.

COMPONENTS OF STOCK FOODS.

The different component parts of stock foods and similar preparations cannot be determined by chemical analysis, except so far as the inorganic constituents are concerned, but, fortunately, a simple microscopic examination will, as a rule, reveal the various plant materials entering into the composition of the "foods," owing to characteristic differences in the histological structure of different parts of plants and of the same parts of different species of plants. Such microscopic examinations have been made by a number of experiment station chemists or botanists, and the results have been published in station reports and bulletins. We know, therefore, quite definitely by this time the character of the materials used in the manufacture of foods of this class. A summary of the results published in regard to the more important stock foods examined by us and reported in the preceding, is given in the following table. It is not likely that all the ingredients of each food given in the table are found in all samples of each brand, since the manufacturers may in some cases have changed their formula, but all the ingredients given have been identified in examinations at one or more of the experiment stations referred to in the table.

CLAIMS MADE FOR STOCK FOODS.

It is often difficult to treat seriously the question of claims made for stock foods, as it does not seem possible that anyone could believe in them. Diseases of entirely different nature and caused by different conditions in the system of animals are claimed to be cured by the feeding of the same remedy, which moreover, as we shall see, has by no means the powerful medicinal effect that the manufacturers would have their customers believe.

It should be stated that some manufacturers of stock foods do not put in "blanket" claims for their preparations, and presuppose a greater intelligence and a better understanding of the conditions of health and disease on the part

TABLE II.—*Principal ingredients of some stock foods.*

Name.	Principal ingredients.	Authority (Experiment Station.)
Ashland Stock Food.	Mustard hulls, wheat offal, corn meal, fenugreek, common salt, charcoal, saltpeter, Epsom salt, glauber salt, lime.	Mass., N. J.
Baum's Horse and Cattle Food.	Oil meal, fenugreek, pepper, gentian (?), charcoal, common salt, Epsom salt, glauber salt, saltpeter, sulfur.	Mass., Conn., N. J., R. I., Pa.
Capitol Stock Food.	Wheat offal, fenugreek, aniseed, mustard, pepper, cinnamon, charcoal, common salt, Epsom salt, sulfur.	Mass.. Ia.
Clover Brand Stock Food.	Pine bark, fenugreek, ginger, gentian, capsicum, sassafras, common salt, charcoal, sulfur.	Iowa.
Fleck's Stock Food.	Oil meal, wheat offal, fenugreek, gentian, pepper, oats, common salt, Epsom salt, sulfur, charcoal.	Mass., Ia.
Gold Coin Cattle Fattener.	Wheat offal, pepper, common salt, sulfur.	Iowa.
Dr. Hess' Stock Food.	Wheat bran, oil meal, fenugreek, gentian, pepper, bean or pea hulls, common salt, Epsom salt, glauber salt, saltpeter, gypsum. iron sulfate, charcoal.	Mass., Ia., R. I., Pa.
Dr. Hess' Poultry Pan-a-ce-a.	Wheat offal, red pepper, asafoetida, common salt, Epsom salt, iron sulfate, venetian red, sand, lime carbonate and sulfate, charcoal.	Conn., Mass., Ia., R. I., Pa.
International Stock Food.	Wheat offal, oil meal, red pepper, gentian, common salt, numerous seeds, plant tissue.	Conn., Mass..N.J., R. I., Pa , N. C.,
Pratt's Food for Horses and Cattle..	Corn and wheat offal, bean meal, fenugreek, or fennel, gentian (?), common salt, Epsom salt, charcoal.	Mass., N. J., R.I., Pa.
Prussian Stock Food.	Wheat offal, oil meal, oat hulls, sassafras, red pepper, fenugreek, gentian (?), common salt, sulfur, charcoal.	Iowa.
Wilbur's Stock Food.	Wheat feed, cereal hulls, oil meal, corn, pepper, fenugreek, gentian (?), common salt, charcoal.	Mass., N. J., Ia. Pa.

of their customers than do other manufacturers. But all manufacturers are in the same position, whether claiming much or little, if the claims made are not backed by results. Statements of the results obtained must not be general or vague, but must give the exact conditions under which the comparisons were made, with definite figures, so as to show conclusively that the improvement was obtained through the use of the food and not through changed conditions under which the animals were kept after the feeding of the stock foods was commenced. The testimonials as to the value of stock foods which we see everywhere in advertisements in the agricultural press, in printed circulars, posters, etc., in the majority of cases are doubtless based on impressions and opinions without solid foundation in fact, and where this is not the case, conditions other than the feeding of stock foods are in all probability responsible for the favorable results reported. A careful survey of our agricultural literature cannot but show this to be a correct statement.

We might dismiss the subject with these remarks, but for the fact that they would probably fail to carry conviction to many farmers who in the past have accepted, without a question, the manufacturers' word as to the value of their preparations; hence, a condensed statement of all available experimental evidence bearing on the question of the value of condimental stock foods for feeding farm animals has been prepared and is given in our bulletin 151 (p. 12–27).

SUMMARY OF FEEDING EXPERIMENTS WITH STOCK FOODS.

The feeding experiments quoted in the bulletin include twenty-three different trials, conducted at more than a dozen different experiment stations with 992 animals in all; viz, with 78 steers, 81 dairy cows, 604 sheep, 112 pigs, and 117 hens. The men conducting the experiments in nearly all cases were professors of animal husbandry in the various stations and were especially trained for studying problems connected with the feeding of the various classes of farm animals. It would seem, therefore, if there be any unanimity whatever in regard to the results of the experiments, that they ought to definitely settle the question of the value of condimental stock foods for farm stock. In going over the evidence presented we find that only one out of the twenty-three different trials showed the stock food to possess any merit; the conclusion drawn from the results of the twenty-one trials is to the effect that nothing was gained by including these foods in the rations fed; in fact, they were shown to be a positive detriment in so far that they rendered the rations more expensive and increased the cost of the product obtained, whether this be gain in live weight, milk, butter fat, wool, or eggs.

The single exception was found in the case of an experiment with pigs at the Indiana Experiment Station, in which the lot fed condimental foods gained 1¾ pounds a week more than the control lot. A pound of pork was produced at a slightly lower cost by the former lot (a saving of 2 cents) and yielded a 7 per cent higher net profit than the control lot. If, however, the stock food be considered worth 10 cents a pound, which is a fair average price, the result of this experiment will also be against the stock food, as regards both the total cost of food and the cost per pound of gain, while there will still be an increase in the net profit from feeding the lot receiving condimental food, amounting to 2 per cent only. This is an insignificant gain, which can easily be accounted for by influences other than the feed which had a bearing on the results of the experiments.

Whether or not much attention be given to the results of this experiment, it may therefore safely be concluded that the evidence is practically unanimous *against* the use of condimental stock foods, and goes to show that, when fed under conditions similar to those that prevailed in these experiments, the addition of stock food to the ration is a positive disadvantage with reference to both the production of the animals and the relative cost of the production. It should be stated that this conclusion is drawn from experiments with healthy animals only, and such as may be supposed to have been kept under favorable conditions as regards feed, care, etc. The manufacturers' claim that the stock foods are valuable when fed under such conditions is, therefore, not in accordance with the verdict of careful, painstaking experiments conducted by specialists in this country and abroad.

If this conclusion be accepted, as it would appear it must be, in view of the facts presented in the preceding, it may still be said that stock foods are valuable in feeding farm animals that are in poor condition of health, off-feed, or ailing in one way or another. It is only fair to state that there are stock food companies who base their claim of merits for their preparations on these grounds only,—at least, after they can no longer defend claims based on other grounds. This phase of the subject should therefore receive serious consideration.

MEDICINAL EFFECTS OF STOCK FOODS.

What are the facts as regards the medicinal or tonic effects of stock foods on the health of the animals? The first point to bear in mind in this connection is the fact that a large proportion of the various stock foods on the market is composed of materials having no medicinal properties whatever, like mill feeds, oil meal, etc. The Iowa Experiment Station states that the great bulk (one-half or more) of most stock foods is made up of some common feeding stuffs worth not more than $1.50 per 100 pounds; about one-tenth is common salt and another one-tenth is charcoal. This leaves three-tenths to be made up of such simple drugs and remedies as anis, sulfur, ginger, red pepper, sassafras, and the like.

The "filler" generally possesses considerable nutritive value when fed in quantities, but is of no importance as a food or otherwise when fed in spoonfuls once or twice a day. The balance of the stock foods is, as previously stated, made up of small quantities of inorganic materials like salt, sulfur, Epsom salts, and of ground herbs, bark, roots, etc., that possess mild medicinal properties, some of them being stimulant, or stomachic, others laxative, astringent, carminative, etc. On account of the small proportions in which they are found in the stock foods it is, however, extremely unlikely that they can have any appreciable influence on the health of the anmials when fed as directed. "Gentian is by far the most potent and important of the remedies found in stock foods. It may be said to be the very backbone of stock foods and tonics. However, the dose of gentian for the horse is one ounce, and for the cow two ounces of the pure drug. Two ounces of the pure drug is more than a tablespoonful, so when a farmer gives his animals a tablespoonful dose of stock food, in which there is no more than 2 per cent of gentian, he is giving the animal one-fiftieth to one-hundredth as much of the drug as it should receive if it were actually in need of that particular medicine."*

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* Iowa Expt. Sta. Bul., 87, (Jan. 1907.) See Agriculture of Maine, Thirty-eighth Ann. Rpt., p. 158, as to value of fenugreek and gentian as tonics.

In general, the prescribed doses of these various drugs, according to the best veterinarians, are from five to ten times greater than can possibly be obtained in following the manufacturers' directions, and that such a method of treatment would be effective in the cure of any one disease, not to say all diseases, is certainly a tax on the credulity of the purchaser. In many cases the manufacturers of stock foods have compounded their mixtures regardless of the properties of the drugs used and frequently instead of being made according to scientific formulae, as is generally claimed, the food is rather a heterogeneous mixture of drugs of opposing properties, and of doubtful efficacy for the ailments specified.*

Worthless ingredients are also sometimes claimed to possess medicinal properties. One manufacturer of a stock food thus writes concerning pine bark, a constituent of their preparation which is not recognized by the profession as possessing any medicinal properties: "We know that the pine bark in our tonic in itself is of more value than many stock foods,"—a statement that perhaps comes nearer the truth than supposed by the manufacturers.

Misleading claims are, in general, frequently made on the labels or printed matter prepared by manufacturers of stock foods. In the Iowa bulletin just referred to, attention is thus called to an "anti-shrink compound," selling for $5.00 per package, and according to the manufacturers' statements, composed of native herbs and containing no minerals. "Everything in this medicine is purely vegetable and non-toxic in effect." It was found to be made up largely of mineral matter and to contain 85 per cent of common salt. It also contained alum, an astringent which causes the intestinal and urinary tracts to close up and hold all or nearly all that the animal takes in after receiving a dose of the mixture. "Five dollars per package of a few pounds of a compound that is made almost entirely of common salt, alum, and charcoal is exorbitant. The sale of 'Anti-shrink' as a purely vegetable compound is fraudulent misrepresentation."

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*N. J. Expt. Sta. Bul. 184, Mar., 1905.

Salt is in itself an effective condiment, as is well known, at least to observing dairymen; in fact, good authorities maintain that salt possesses more tonic qualities than most of the medicinal ingredients in stock foods. Since it costs less than ½ cent a pound, it would hardly seem a good business proposition therefore to pay ten cents a pound or more for a stock food which contains only a small proportion of medicinal materials, that are, moreover, less valuable for the purpose intended than is salt alone.

TESTIMONIALS IN REGARD TO STOCK FOODS.

A question naturally suggests itself at this point: If condimental foods are of no more value than may be inferred from the evidence presented in the preceding, how can we explain the testimonials from farmers in regard to the benefits derived from feeding stock foods, which manufacturers are distributing broadcast, or that twenty million farmers (nearly one-fifth of our total population), are constantly using one stock food alone, according to what the manufacturer tells us. One explanation has already been suggested. There is in many cases no definite knowledge back of the testimonials; a farmer may commence using a stock food; along with it comes directions for feeding and suggestions as to care of farm stock and, being anxious to do better, he uses the food according to the directions given, and his stock begins to improve. The stock food gets the credit, but it is evident that the improvement may as well be credited to the better care and attention given to the stock after the feeding of the stock food had commenced. Of course, the manufacturer is entitled to credit for the change wrought, no matter whether it belongs to the stock food or the method of feeding and caring for the stock. By following the advice as to feeding of farm animals given in experiment station bulletins, at farmers' institutes, and in the agricultural press, the chances are, however, that equally good, if not better, results would have been secured and at no additional cost to the farmer.

The writer is not disposed to question that many farmers who have made a practice of using stock foods in the past, have done so in good faith, believing that the improvement noted did come from their use. The evidence at hand clearly points to the conclusion, however, that as a general rule, the credit is wrongly placed, and that as good results might have been secured much more cheaply by a simple change of diet or by taking better care of the stock. Thousands of our most progressive and intelligent business farmers, horsemen, cattlemen, feeders and breeders of dairy cows, sheep, and other classes of farm animals do not find it necessary to use such foods and never keep them on hand; they do, however, keep on hand, certain common remedies that experience and veterinary science have taught us possess specific action in the case of a general debility of the system or of certain diseases, and when necessary they apply these remedies with full assurance of successful treatment, except in very aggravated cases when it becomes necessary to call in a veterinarian. The continual dosing of farm stock with medicines or even stock foods is generally admitted to be detrimental and defeats the object sought, since the system gradually becomes less responsive to the stimulant action of the condiment or medicine when this is fed for a long time, and increasing doses or new remedies are then required in order to produce the required results. It is therefore sound advice to recommend the use of the pure drugs for specific ailments, and in cases of a general debility of the system, when stock is not thrifty, is "off feed", or for other reasons in apparent need of a tonic, to change the ration and introduce some new feed that will give variety to the ration fed and thus stimulate the appetite of the animals.

If the farmer considers it necessary to feed stock foods, we would suggest that he purchase the necessary ingredients at a drug store and mix them in proportions like those given below. He will save a great deal of money by doing so, since the components of stock foods on the average cost only a fraction of the price charged for the cheapest of them, and he will have the additional satisfaction of knowing just what he is feeding his stock and of feeding it in a much more concentrated form than in the case of the commercial preparations.

This is a good business policy, and must appeal to all farmers who give a moment's intelligent consideration to the subject.

FORMULAE FOR STOCK FOODS.

The following mixtures of drugs have been suggested by two of our Experiment Stations:—

First formula.—Ground gentian, one pound; ground ginger, ¼ pound; powdered saltpeter, ¼ pound; powdered iron sulfate, ¼ pound. Mix, and give one tablespoonful in feed once daily for ten days, omit for three days, and feed as above for ten days more.

This mixture can be obtained for 20 cents a pound, and has probably more than four times the value of most condimental foods on our markets as a tonic, for the reason that it contains no "filler". "It is concentrated instead of diluted. It is all drug and not mostly feed stuff, and hence far stronger. It is probably at least as effective as, and certainly far cheaper, than the generality of condimental foods." *

Second formula.—Fenugreek, 8 pounds; ginger, 8 pounds; powdered gentian, 8 pounds; powdered sulfur, 8 pounds; potassium nitrate, 8 pounds; resin, 8 pounds; cayenne pepper, 4 pounds; flax-seed meal, 44 pounds; powdered charcoal, 20 pounds; common salt, 20 pounds; wheat bran, 100 pounds.†

"This mixture is so near the average stock food that neither the farmer nor his stock could tell the difference. After paying the druggist 50 per cent profit on the ingredients, this mixture would still cost less than $4.42 per hundred pounds. While a tablespoonful of such mixture would not put his stock on the market in thirty days less time, nor double the flow of milk of his dairy herd, or prevent cholera in hogs, abortion in cattle, roup in chickens, and glanders in horses, * * * it would have the credit for being extremely inexpensive, besides having as much credit in other ways as any of its class."

CONCLUSIONS.

The evidence at hand goes to show that there is a practical unanimity of opinion among scientific men in public positions who have given the subject special study, in regard to several points connected with condimental stock foods:—

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* Me. Rept. 12, 1896, p. 52; Vt. Bul. 104, Dec. 1903, p. 190.

† Ia. Expt. Sta. Bul. No. 87, Jan. 1907.

First, they are of no benefit to healthy animals when fed as directed, either as to increasing the digestibility of the feed eaten or rendering it more effective for the production of meat, milk, wool, etc.

Second, they are of no benefit as a cure-all for diseases of the various classes of live stock; neither do they possess any particular merit in case of specific diseases, or for animals out of condition, off feed, etc., since only a small proportion of ingredients having medicinal value is found therein, the bulk of the foods consisting of a filler which possesses no medicinal properties whatever.

Third, exorbitant prices are charged for these foods; this is natural, considering the extensive advertising the manufacturers are doing, and the liberal commissions which they pay agents and dealers. The large sales of stock foods are doubtless mainly to be attributed to these facts.

Fourth, by adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock foods of any kind. If a farmer believes it is necessary to feed stock foods at times, he can purchase the ingredients at a drug store and make his own stock foods at a fraction of the cost charged for them by the manufacturers. He will then have the additional satisfaction of knowing just what he is feeding, and of feeding a concentrated "food" instead of one largely diluted with non-medicinal ingredients.

We have seen that the farmers of our State are spending something like one-third of a million dollars annually for foods of this class, which are not supposed to be foods, and cannot, as a general rule, be classed as medicines. This amount of money is more than three times what it costs to run our State Agricultural College and Experiment Station for a year, and is more than all the buildings belonging to our Agricultural College have cost the State.

From a careful survey of the different phases of the subject we feel warranted in stating that a net saving of at least a quarter of a million dollars would result to the State if our farmers discontinued the use of these foods and would purchase in their stead similar amounts of standard concentrated feeds. It is hoped that the evidence brought forward in the preceding, and the discussions which have been given in this place and in our bulletin 151 will tend to call the attention of our farmers to the subject and enable them to look upon condimental stock foods in their true light.

VARIATIONS IN THE AMOUNT OF CASEIN IN COWS' MILK.

E. B. HART.

There is a general belief among dairymen and some dairy chemists that casein and fat are present in milk in constant relative proportions. That given the percentage of fat in milk, the percentage of casein can be directly calculated by rule. This rule was formulated by Van Slyke* and is based on averages of numerous analyses made at the New York Agricultural Experiment Station. The rule is to be applied especially to milks ranging from three to four and one-half per cent of fat and is stated as follows: To find the per cent of casein in milk when the per cent of fat is known, subtract three from the per cent of fat in milk, multiply the result by .4 and add the result to 2.1. The limitations placed on the rule as applicable to milks containing but from three to four and one-half per cent of fat led the writer to inquire how applicable it might be to milks of higher fat content. Hill,† as early as 1890, showed that in individual cows the proportion between fat and casein is widely different. He however obscured this important fact by conclusions based on averages of many milk analyses. His conclusion was that normal milks, whether rich or poor, have on an average one-fourth as much casein as total solids, though he further says that single samples may depart widely from this standard.

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*Modern Methods of Testing Milk, p. 192.

† Fourth Ann. Rept. Vt. Agr. Expt. Sta.

Shuttleworth,* from work on individual cows, showed that a considerable variation in the proportion of casein to fat existed among different animals, and that a ratio established for one period of lactation in any single animal may not be the same as the ratio found at some other period for the same animal.

A priori, there seems to be no good reason why we should expect a definite quantitative relation between these two constituents of milk. They are entirely unlike in chemical constitution and their elaboration has been along different lines of synthesis. If we could suppose that they have resulted from the splitting of a single chemical entity, then there would be reason for a definite relation between the amounts of these two bodies in this secretion. But the facts regarding the production of milk constituents do not appear to support any such hypothesis. The most variable milk constituent we have is the fat, which may rise and fall from day to day in no inconsiderable amount, dependent on feed and the environment to which the animal is subjected. During such fluctuations of the fat content, the casein may remain constant. Instances are on record† where the fat content of the milk has dropped from 3.25 per cent to 2.20 per cent, while the casein content of those milks remained at 2.08 and 2.18 per cent respectively. This at least would indicate that the precursor of these two important milk constituents was not a single chemical entity, which seems a necessary assumption if the two bodies are to remain in constant relative proportion. On the other hand, it indicates rather a differential process, with the formation of fat and casein as distinctive and dependent upon inherent cell characteristics.

Again, the relation of fat to casein in a cow's milk, established for one period, may not be found to be the same at some later period of lactation. In fact, it appears to be the normal tendency for the nitrogen compounds of milk to increase relatively to the fat with the advance of lactation.

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* Rept. of Ontario Expt. Farm, 1895.

† Tech. Bul. No. 1, N. Y. Agr. Expt. Sta.

Further, while there is no doubt that the rule above formulated is fairly accurate when applied to the mixed milk of herds made up of grade animals, it appears entirely possible that it might not be applicable to mixed milks produced by animals of high fat-producing capacity.

The fact that progressive dairymen are displacing the low fat producing animals with those producing higher fat yields shows a tendency to move away from the application of the rule.

From the standpoint of the breeder of dairy cows and the cheese-maker, it would appear extremely important to know whether or not animals producing milks of five to six per cent fat content, are producing a definitely related percentage of casein, and with animals producing three to five per cent of fat, whether that same relation holds true. If it does not, then it would appear that here is important work for breeders of dairy cows in the selection and production of animals producing milk more fitted for the butter or the cheese industry, as the case may be.

STUDIES OF THE UNIVERSITY HERD.

No attempt was made to follow the animal through long periods of lactation. The only attempt made here was to learn whether the variations of fat to casein in different animals were of any significance and what might be expected any time an analysis was made.

Casein determinations were made by the Official Agricultural Chemist's method; the only variation was the use of the factor 6.38 instead of 6.25. The samples were from a mixture of night's and morning's milk. Fats were run by the Babcock test from composite samples selected over a period of one week in the usual way. The collection of the samples for casein determination was made in the middle of the week during which the fat sample was being taken. The analyses cover a period from July 26 to August 7. The animals are arranged in the table according to breed. The table contains, besides the percentages of fat and casein, a column showing the amount of casein calculated by Van Slyke's rule from the fat content. Besides these data, two separate columns show the relations of fat to casein and casein to fat.

TABLE I.—*Analysis of milk of University herd.*

Breed.	Name of cow.	Per cent of casein found.	Per cent of casein calculated.	Per cent of fat.	Relation of fat and casein.	Relation of casein and fat.
Jersey	Laura	2.45	2.60	4.27	1.74:1	.57:1
	Double Time,	3.11	2.83	4.83	1.55:1	.64:1
	Macella	3.31	3.28	5.95	1.79:1	.55:1
	Just in Time	3.65	3.24	5.85	1.60:1	.62:1
	Sadie	3.00	2.81	4.79	1.59:1	.62:1
	Jeweletta	2.92	3.30	6.02	2.06:1	.48:1
Guernsey	Cozie	3.50	3.38	6.21	1.77:1	.56:1
	Floradora	2.77	3.30	6.01	2.16.1	.46:1
	Queen	3.09	3.02	5.31	1.71:1	.58:1
	Mollie	3.12	3.08	5.46	1.75:1	.57:1
	Hannah	2.91	2.85	4.89	1.67:1	.59:1
	Countess	2.60	2.94	5.11	1.96:1	.50:1
	Dorine	2.47	3.05	5.37	2.17:1	.46:1
	Muriel	2.98	3.31	6.04	2.03:1	.49:1
Holstein	Alma	2.10	2.17	2.96	1.41:1	.70:1
	Joe	2.13	2.17	3.19	1.49:1	.66:1
	Maggie	2.50	2.27	3.44	1.37:1	.72:1
	Johanna	2.16	2.32	3.56	1.55:1	.60.1
	Maxie	1.88	2.17	3.18	1.52:1	.65:1
	Marie	2.15	2.11	3.03	1.40:1	.70:1
Brown Swiss	Irma	2.66	2.61	4.29	1.61:1	.61:1
	Merney.	2.70	2.49	3.99	1.51:1	.66:1
Ayrshire	Priscilla	2.56	2.34	3.61	1.41:1	.70:1
	Christina	2.14	2.87	4.93	1.57:1	.63:1
	Adelaide	2.47	2.28	3.47	1.40:1	.71:1
	Jeanette	2.61	2.32	3.57	1.36:1	.73:1

The table shows that in a large number of instances the application of the rule gives data agreeing closely with actual determination. There are, however, as Dr. Van Slyke has already emphasized, high fat milks where the agreement is not very close, and actual determinations would alone disclose their true casein content. Dorine, with a fat content in her milk practically identical with that of Molly, nevertheless shows a casein content .65 per cent lower than the latter animal.

The table further shows that there is considerable relative variation of fat and casein not only among animals of different breeds, but between animals of the same breed. Percentage variation of casein ranges from 1.88 in Holsteins to 3.65 in Jerseys. Among Holsteins themselves the range of percentage is from 1.88 to 2.50, while among Jerseys it is from 2.45 to 3.65. Reduced to a ratio of pounds of fat to pounds of casein, we have among different breeds, for instance, at the time these analyses were made, Jewel, a Jersey, showing 2.06 pounds of fat for every pound of casein, while Maggie, a Holstein, shows 1.37 pounds of fat for one pound of casein. Floradora, a Guernsey, shows 2.16 pounds of fat for every pound of casein, while Adelaide, an Ayrshire, shows 1.4 pounds of fat for one pound of casein. These are the extreme cases among the number of animals investigated.

Among breeds themselves, we have Jewel, a Jersey, with a ratio of 2.06 pounds of fat to 1 of casein, while Macella of the same breed shows a ratio of 1.79 pounds of fat to every pound of casein. Stated in another way, Jewel shows .48 pounds of casein for 1 of fat, while Macella shows .55 pounds. The data on the milks of these two cows clearly show that relative to their fat, Macella is the greater casein producer. The yield of cheese from the milk of Macella must necessarily be larger, under uniform conditions of manufacture, than from that of the other animal. Again, Cozie showed a relation of 1.77 pounds of fat to 1 of casein, while Floradora showed the relation of 2.16 to 1. Cozie shows the relation of casein to fat as .56 to 1, while Floradora's relation is .46 to 1. The milks from these animals were at about the same period of lactation.

A further consideration of the table reveals the fact that among breeds the Holstein, Brown Swiss, and Ayrshire uniformly show a higher relative proportion of casein to fat than do the Jerseys and Guernseys. It also shows that certain individuals among the two latter breeds may show as high a relation of casein to fat as certain individuals among the other breeds.

What these animals will do for a whole year is not known, but enough data is at hand to emphasize the fact that individual differences in casein-producing power do occur among animals of different breeds, and surely may occur among animals of the same breed, and that the casein-producing power does not necessarily bear any close relation to the fat-producing power. That a higher fat holding milk means an increased casein holding milk is not here denied, but that the increase is in a fixed proportionate ratio, the data do not support. It emphasizes, it seems, the fact that the casein and fat producing function is in part, if not largely, individualistic, and capable of being used in producing dairy types of animals, either for an industry in which fat plays the most important rôle, or a cheese industry, where both fat and casein are primarily concerned.

SUMMARY.

1. The relation of casein to fat in cows' milk is a variable one.
2. One of the prime factors controlling its relation is individuality.
3. The relation of casein to fat varies among animals of different breeds and among animals of the same breed.
4. Direct determination of both fat and casein seems necessary in determining the value of the milk of any single cow for cheese production.

A SIMPLE MECHANICAL METHOD FOR THE ESTIMATION OF CASEIN IN COWS' MILK.

E. B. HART.

The valuation of milk by the estimation of its fat content was consummated through the evolution of the Babcock test. This rapid and accurate test for milk fat placed in the hands of milk producers a simple instrument for the measurement of the amount of fat contained in their milk. The method, however, estimates but a single constituent—butter fat—and when that constituent is the only one involved, as in the butter industry, or creamery industry, it is clear that the fat content is the controlling factor for the valuation of those milks.

When, however, any of the other constituents of the milk enter into a manufactured produce it is equally clear that their proportion in the original milk must affect the yield of the manufactured product. If the manufacture of milk sugar raised itself to a commercial industry, that industry should invoke for one of its first aids to a sound business policy a control of the amount of milk sugar in its raw material.

Such control is already inaugurated in the butter industry through the Babcock test. In the valuation of milk for cheese production both fat and casein (the important nitrogenous constituent of milk) should be considered, since both enter into the manufactured product. The proposition that the percentage of fat is also a measure of the value of nearly all milk for cheese-making has not been generally accepted. Van Slyke* after an extended investigation of the relation of casein to fat in herd milks, concluded that as a rule there was two-thirds of a pound of casein for each pound of fat in the milk whether the milk contained three or four per cent of fat. When the amount of fat increased beyond four and a half per cent there was a gradual but slight diminution of casein for each pound of fat.

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*N. Y. Agr. Expt. Sta. Bul. 68. New series.

Babcock* concludes that at the same season of the year rich milks do not yield as much cheese in proportion to the fat they contain as do poor milks, but that a rich milk toward the end of the season may do as well as a much poorer milk earlier in the season. Dean† has found that uniformly a rich milk yields less cheese in proportion to the fat contained in it than a poor milk.

The conclusions of these authorities are quoted for the purpose of emphasizing the fact that there appears to be no constant and close agreement between the relative proportion of casein and fat in cows' milk at any period of lactation. However, it is pretty well affirmed that herd milks rich in fat are also richer in casein, and further that the cheese made from the richer milk results in a product of finer quality. In the absence of a simple casein test there is consequently no question but that the most equitable basis for the valuation of the milk for cheese production is on its fat content. While, as Van Slyke has shown, milks testing 3 per cent of fat contain an average of 2.1 per cent of casein, with a casein increase of .4 per cent for an increase of 1 per cent of fat above 3, he also concludes that in the later stages of lactation the ratio of casein to fat is greater than is indicated by this rule.

In the milk of individual cows there is certainly no definite and constant relation between the fat and the casein. No rule applicable to all individuals can be formulated. One animal may yield a milk containing 2.7 per cent of casein and 6 per cent of fat, while another produces a milk of 2.7 per cent casein and 4 per cent fat, and still another a milk carrying 3.5 per cent of casein and 6 per cent fat. These figures are actual analyses of milks from individual cows in the University herd. Clearly then, the determination of a single constituent can not serve as a basis for classifying these milks.

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*Wis. Agr. Expt. Sta. 11th Ann. Rept. p. 137.

†Ont. Agr. Col. 21 Ann. Rept. p. 44.

It was in hopes of supplying some simple, reasonably accurate method for the estimation of casein in cows' milk that this investigation was undertaken. As a simple, mechanical method, operative by the unskilled, and reasonably rapid was desired, resort to the centrifuge was made.

PRINCIPLES INVOLVED IN THE METHOD.

1. Construction of tube and scale whereby percentages of casein in the milk are read directly.
2. Establishment of a proper volume of milk to be used that will conform to the tube and scale adopted, allowing percentage of casein to be read directly.
3. The precipitation of the casein by dilute acetic acid.
4. Agitation of the precipitate with chloroform to remove the fat.
5. The application of a definite centrifugal force in order to mass the casein into a pellet.
6. Reading the per cent of casein.

DESCRIPTION OF APPARATUS.

The form of the tube* used is shown in the cut (Fig. 17). This should be made of well annealed glass and should contain up to the neck not less than 35 cubic centimeters. The tube is approximately 14 centimeters long, with the neck constricted to a diameter of 1.8 cubic centimeters. The barrel, including the neck, has a length of 7 centimeters with an external diameter of from 2.6 to 2.7 centimeters. The graduated tube is approximately 7 centimeters long and 1.2 centimeters external diameter. Each division of the scale represents .1

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*At the time this tube was designed the author was unaware of the existence of the very similar Hortvet tube, designed by Hortvet and used in the analysis of saccharine products. Jour. Amer. Chem. Soc., 1904, 26. Knowledge of the existence of this tube only came at the time of reprinting Bul. 107, Bureau of Chemistry on the Official Methods of the Association of Agricultural Chemists.

cubic centimeter and .2 per cent of casein where 5 cubic centimeters (equivalent to 5.15 grams of milk) are used in the test; the specific gravity of normal cows' milk is assumed as 1.030. The graduations extend from 0 to 10 per cent, amply sufficient for all normal milks. The 10 per cent mark represented on the scale should correspond to exactly 5 cubic centimeters. The experimental tubes used in the test were made by E. H. Sargent & Company, Chicago, Illinois.

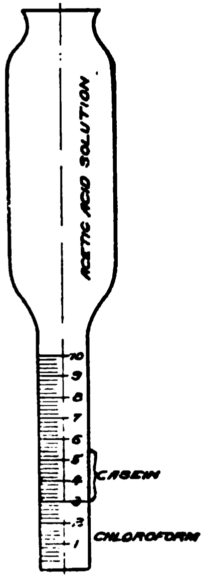

Fig. 17.—Form of tube used in making casein determinations.

CENTRIFUGE.

Under the conditions of the test herein described the wheel carrying the bottles must be of standard size. The diameter adopted includes the circle formed with the pockets distended, and is fifteen inches. Six or twelve pockets, as desired, can be arranged in this circle. The centrifuge should be strongly made and run easily to avoid accidents. The experimental centrifuge used in evolving this test (Fig. 18) was made by the Creamery Package Company, Chicago, Illinois. It is encased, with the revolving cups arranged to turn in the regular sixteen inch diameter Twentieth Century Babcock Fat Tester. The only modifications are the structure of the wheel carrying the pockets and the pockets themselves. The gears are also changed in order to give easily by hand a speed of 2,000 revolutions per minute. The pockets are 2.8 centimeters in diameter and 11.2 centimeters long. It is important that the bottom of each pocket should be provided with some arrangement for centering the tube and also forming an elastic cushion on which the tube is to rest. I have used to advantage ordinary cork stoppers bored out to within one-eighth or one-sixteenth of an inch from one end, and just large enough to admit the graduated portion of the tube. Fig. 19 illustrates this arangement. As the method is entirely dependent upon the application of a definite centrifugal force within a definite time, it is clear that any modification of the radius of the revolving wheel without modifying the number of revolutions, will vary the force applied and consequently alter the space occupied by the pellet.

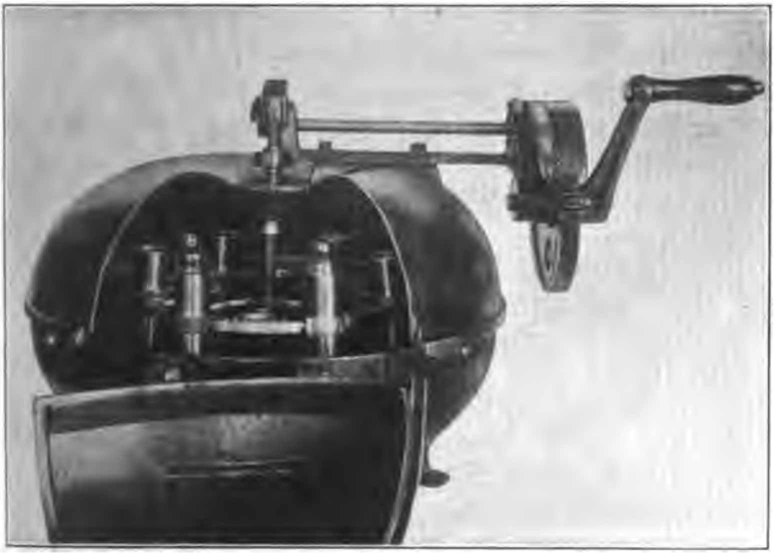

Fig. 18.—The centrifuge used in evolving the casein test.

The formula expressing this force is $F=\frac{mv^2}{r}$ where m equals the mass, v the velocity expressed in feet per second, and r the radius. In the description of the centrifuge, it has been stated that the diameter of the revolving wheel was 15 inches. Since the casein tubes themselves rest on a cork cushion, approximately one-eighth of an inch thick, it is clear that the circle in which they revolve is not 15 inches but 14.75 inches. This gives r a value of 7.375 inches, and with m equal to unity and the number of revolutions 2,000 per minute, as adopted for the conditions of the test, F becomes 26,911.9.

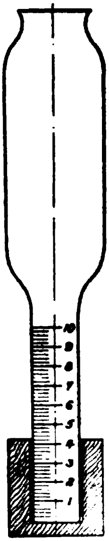

Fig. 19.—Casein tube and cork support.

With 26,911.9 as the required value for F it becomes but a matter of calculation to determine the number of revolutions per minute required with any other radius; for example, suppose the revolving wheel radius of a machine to be twelve inches, then substituting in the above formula we have $26,911.9 = \frac{mv^2}{12}$ inches. As the formula here implies feet per second, the denominator, twelve inches, becomes unity, and with m equal to unity the equation becomes $26,911.9=V^2$, then V=164 feet per second. With a radius of twelve inches the number of revolutions per second is found from the equation $\frac{164}{2\pi r}$ = 26.1 revolutions per second. This multiplied by 60 gives the revolutions per minute, or 1,566. It is probable that the dimensions adopted in the experimental tester—a revolving wheel fifteen inches in diameter, with the casein tubes themselves revolving in a circle 14.75 inches in diameter and at a speed of 2,000 revolutions per minute—will be suitable for most occasions.

Acetic acid solution.—The dilute acid solution used in the precipitation of the casein is prepared from glacial acetic acid of highest purity, 99.5 per cent. A 10 per cent solution by volume is first made by diluting 10 cubic centimeters of the glacial acid to 100 cubic centimeters with water. Of this stock solution 25 cubic centimeters are diluted to one liter. This gives a 0.25 per cent solution, 20 cubic centimeters of which (the volume used in the test) contains 0.5 cubic centimeters of a 10 per cent solution of acetic acid. This is ample for complete precipitation of the casein of all normal milks with the danger of solution of the casein reduced to a minimum. Of course it is understood that the requirements of this solution are such that each 20 cubic centimeters used in the test should contain 0.5 cubic centimeters of a 10 per cent solution of acetic acid and for a chemist the preparation of such a solution need not require glacial acetic acid. Acid of the glacial character is recommended more particularly for those who will prepare the solution without the aid of chemical analyses.

Chloroform.—This should be of best quality.

Pipette for measuring the milk.—The proper volume of milk to be used and necessary under the conditions adopted, is 5 cubic centimeters. This allows percentage of casein to be read directly on the scale. The pipette preferred is one with a wide opening at the lower end to allow the milk to run freely. It should be accurately calibrated.

MAKING THE TEST.

The tubes should be hung in a rack or some way supported in an upright position to facilitate filling. Two cubic centimeters of chloroform, fairly accurately measured, are placed in the tubes and on top of the chloroform are added approximately 20 cubic centimeters of the 0.25 per cent solution of acetic acid. The temperature of the acetic acid solution should be as nearly 70°F. as is practicable. I have set 70°F. as the proper temperature for the test as this is an average normal room temperature. However, a range of 5° on either side of this figure will not introduce a serious error. A low temperature tends to give a high reading, while a high temperature depresses the volume of the casein. It is therefore recommended that the solution be as near 70°F. as possible. Five cubic centimeters of milk, accurately measured, are next introduced into the tube; every precaution should be taken to have the sample represent as nearly as possible the whole lot of milk from which it is taken. The temperature of the milk should be from 65 to 75°F. After the introduction of the milk the thumb is placed over the neck of the tube, the tube inverted by rotating the hand in order to bring the chloroform down into the barrel part of the tube, and the whole then shaken with reasonable vigor for fifteen to twenty seconds. This should be timed by the watch. The purpose of shaking is to break up the chloroform mass and bring it into intimate contact with the fat globules, thereby dissolving them. If the shaking is continued for too long a time a partial emulsion is effected, with a tendency toward a high reading and a very ragged reading line between the chloroform and the casein. After shaking, the tubes can be placed immediately in the centrifuge or, when a great number are being run, can be allowed to stand until the same process has been repeated on the others. It is better to prepare all the tubes with the chloroform acetic acid mixture, then introduce the milk and proceed with the shaking on the whole series, than to prepare each tube singly. The reason for this is that too long a contact with chloroform may vitiate the results. No harm whatever results if the tubes after shaking and before centrifuging are allowed to stand fifteen to thirty minutes, but longer standing than this can introduce an error.

The tubes are next placed in the centrifuge, with the diameter of the revolving wheel fifteen inches when the tubes stand extended. The fifteen inches, as has been stated, allows for one-eighth inch cushion on the bottom of the metallic pockets. The machine should be run closed. After the speed of 2,000 revolutions per minute has been obtained the test is run 7.5 to 8 minutes. A slight variation from the above speed will not introduce a serious mistake. A range of fifty on either side is allowable. To facilitate proper control of the speed I have used a metronome to the greatest advantage. In fact, it is necessary for the proper control of the hand centrifuge. With the number of revolutions of a single cup in your revolving wheel known for a single revolution of the crank handle, the number of times necessary for the proper speed of 2,000 revolutions per minute is directly ascertainable. In our experimental machine each pocket makes 36 complete revolutions for each turn of the crank handle, consequently, it was necessary to turn the crank 55 or 56 times per minute to develop a speed of 2,000 revolutions per minute. With the metronome set to audibly beat that number of revolutions per minute, the operator of the centrifuge, after a little practice, can keep in perfect rhythm with the beats.

As soon as the tubes have been properly whirled they should be removed and placed in a rack supporting them in an upright position. If properly worked the casein will rest as a sharply defined white mass above the chloroform, which now holds the fat in solution, while above the casein will be a water clear solution of the other milk solids. The tubes should be allowed to stand at least ten minutes before reading. This is imperative. After suddenly relinquishing the centrifugal force from the casein pellets, a proper time is necessary for them to regain a constant volume. This requires at least ten minutes. After the first ten minutes practically no change in volume results, even on standing twenty-four hours at room temperature. To measure the casein, hold the tube in a perpendicular position with the scale on a level with the eye. Observe the divisions which mark the highest and the lowest limits of casein. The difference between them gives directly the per cent of casein in the milk. Readings can easily be taken to half divisions or one-tenth of a per cent and with care and practice even to five-hundredths of a per cent. The lines of division between the casein and chloroform on the bottom and the dilute acetic acid solution on the top are usually straight, and no doubt need arise concerning the readings. Occasionally, for reason of improper centering of the tube during the centrifugal process the casein may not be perfectly horizontal with the bottom of the tube; in such cases the readings should be taken only on the side of the tube that is graduated. Occasionally a film, sharp in outline and clearly distinguishable, projects below the layer of casein proper. If this has occurred, the space occupied by this film should not be included in the reading. This film is most often due to too vigorous shaking and can be avoided.

RESULTS WITH THE TEST COMPARED WITH THE OFFICIAL CHEMISTS' METHOD.

In carrying out the estimation of casein in cows' milk by the method of the Official Agricultural Chemists the nitrogen factor used was 6.38 and not 6.25; only in this respect did the method vary from the official one.

In evolving the test it was necessary to establish the volume of milk required, in order that, under the conditions of operation already described, percentages of casein could be read directly. It was found that five cubic centimeters of the milk containing one per cent of casein occupied exactly 0.5 cubic centimeters.

Below are given a few comparative results selected from determinations of five different breeds of dairy cows. Each determination represents a different individual. The results are averages of good duplicates.

TABLE I.—*Comparative determinations of casein by the official method and by the new method.*

Breed of cow.	Official.	New method.
Jersey	2.45	2.50
“	3.31	3.20
“	3.65	3.70
Guernsey	2 47	2.60
“	2.91	3.10
“	3.12	3.05
“	3 50	3.70
Holstein	1.88	1.88
“	2.10	2.08
“	2.13	2.13
“	2.50	2.60
Brown Swiss	2.66	2.65
“	2.70	2.70
Ayreshire	2.56	2.50
“	2.61	2.55
“	3.14	3.18

CONDITIONS INFLUENCING THE TEST.

There are several factors of prime importance in the successful operation of the test that must be kept in mind. Milks of unlike quality and kept under varying conditions are sure to be met. It was necessary, therefore, to investigate several points relative to their influence on the accuracy of the test.

Influence of ripeness of milk.—Milks from six individual cows were taken and the acidity determined. The acidity of portions of these same milks was next raised by 0.1 and 0.2 per cent respectively with lactic acid and the casein determined by the centrifugal method. These acid variations would easily cover the range of milks acceptable at a cheese factory. None were curdled.

The table below gives the results of this experiment.

TABLE II.—*Successive determinations of casein in milks of varying acidity.*

No.	1.		2.		3.	
	Acidity.	Per cent casein.	Acidity.	Per cent casein.	Acidity.	Per cent casein.
1	.15	3.10	.25	3.10	.35	3.05
2	.17	3.05	.27	2.95	.37	3.00
3	.12	2.20	.22	2.15	.32	2.20
4	.14	2.10	.24	2.10	.34	2.10
5	.15	2.60	.25	2.55	.35	2 59
6	.16	2.50	.26	2.45	.36	2.50

The table clearly shows that a degree of ripeness or acidity as high as .35 per cent will not vitiate the determination. A curdled milk can not be accurately run.

Influence of temperature.—In the details of the method given above it has been distinctly stated that the proper temperature for the test is 70° F. This applies to both the acetic acid solution and the milk. An allowance of 5°F. either side of this temperature was made. The results of the influence of different temperatures of the acetic acid solution are given in the following table:—

TABLE III.—*Influence of temperature on the determination of per cent of casein in milk.*

Milk.	68°-70°F.	58°-60°F.	65°-66°F.	74°-75°F.	80°F.	95°F.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	2.80	3.20	2.90	2.88	2.65	2.20
2	3.10	3.58	3.10	3.00	2.85	2.30
3	2.00	2.25	2.00	2.10	1.80	1.70
4	2.05	2.20	2.10	2.00	1.90	1.50
5	2.75	2.80	2.75	2.70	2.45	1.90
6	2.40	2.60	2.45	2.30	2.25	1.80

It is evident from this table that the temperature can influence the reading in a very decided manner. The temperature of the acetic acid solution and the milk should not fall below 65° nor exceed 75°F. In experiments with milks kept in an ice-box and down to a temperature of 50°F., the percentages of casein found were inclined to run a little high when the acetic acid solution was 65°F., and the milk pipetted directly from the cold solution. This is as should be expected. The addition of a cold milk would of course lower the temperature of the entire solution. The temperature of both the milk and acetic acid solution should consequently be between 65° and 75° for accurate results. As near 70° as possible is always to be preferred.

The temperature of the room in which the test is carried out should be as nearly normal as possible. It may, however, rise to a summer heat and fall to 60° without introducing serious error, as long as the temperature of the solution in which the casein is precipitated is approximately 70°F. Too long standing after precipitation at 70° and before centrifuging in a room, the temperature of which is widely different from 70°, should be avoided.

Influence of prolonged shaking.—In the details of the method the time of shaking has been limited to twenty seconds. In the experiments made it was soon found that too long a time, one or two minutes, gave a ragged line at the junction of the casein and chloroform, making sharp readings difficult. This was easily avoided by limiting the time of shaking.

Solution of the fat.—No claim is made that the procedure adopted in the test quantitatively removes the fat from the casein mass. The chloroform does, however, remove such a large proportion of the fat as to make negligible the volume occupied by that remaining undissolved in the casein mass.

Influence of preservatives.—It was thought advisable to test the influence which certain preservatives in common use might have on the accuracy of the casein test. Five different milks with variable casein contents were treated as follows:—

100 cc. milk—0.2 cc. of 40 per cent formaldehyde.
100 cc. milk—One-half No. 2 corrosive sublimate tablet.
100 cc. milk—One-third potassium dicromate tablet.
100 cc. milk—3 cc. chloroform.
100 cc. milk—3 cc. toluol.

The corrosive sublimate and potassium dicromate tablets are those in common use in preparing composite samples for the Babcock test and put up by the Creamery Package Company, Chicago, Illinois. An average weight of either of these tablets is 0.350 grams. An initial analysis of the milks was made. They were then allowed to stand twenty-four hours with the above treatment and again run by the centrifugal method. The results are appended in the following table:—

TABLE IV.—*Effect of different preservatives on the test when in contact for twenty-four hours.*

No preservative.	Formaldehyde.	Corrosive sublimate.	Potassium dicromata.	Toluol.	Chloroform.
2.60	3.80	3.60	2.70	3.20	3.50
3.10	5.40	4.30	3.15	3.00	3.70
2.60	4.60	4.00	2.65	3.00	3.10
2.00	2.90	2.65	2.10	2.60	2.70
2.25	4.30	3.40	2 30	3.00	2.75
2.30	3.70	3.50	2 35	3.30	3.00

The preservatives in all cases but that of the potassium dicromate had a pronounced influence on the test after twenty-four hours' standing, and should never be used when this test is to be applied.

The milks preserved with potassium dicromate were allowed to stand forty-eight hours at room temperature and again run with the following results: 1, 2.65; 2, 3.10; 3, 2.65; 4, 2.10; 5, 2.20; 6, 2.30.

From the above figures it is apparent that no detrimental influence on the accuracy of the test has come into play when potassium dicromate in the dilution prescribed, and over the period of time indicated, is used.

To test further the influence of the potassium dicromate the following experiments were inaugurated:—

One hundred cubic centimeters of milk from six different animals were treated with potassium dicromate in the proportion of one tablet to 300 cubic centimeters of milk. The milks were allowed to stand at room temperature in stoppered flasks. An initial analysis was made before the addition of potassium dicromate. The samples were run at consecutive twenty-four hour periods for six days. The initial analysis was made on October 4. After the sixth analysis, it was necessary to discontinue the test, due to a broken centrifuge. The samples were, however, placed in the ice chest and after the repair of the machine, run again on October 25, or after being preserved for 504 hours. No coagulation had taken place. The data appear in the following table:—

TABLE V.—*The effect of potassium dicromate in the dilution of one tablet to 300 cubic centimeters, on milk when in contact for varying periods of time.*

Initial analysis.	24 hours.	48 hours.	72 hours	96 hours.	120 hours.	144 hours.	504 hours.
3.10	2.90	3.15	3.15	3.10	3.20	3.00	3.05
2.45	2.50	2.55	2.60	2.40	2 55	2.60	2.40
2.65	2.80	2.85	2.80	2.60	2.80	2.80	2.70
2.17	2.05	2.10	2.05	2.00	2.00	2.10	2.00
2.75	2.70	2.85	2.80	2.70	2.70	2 85	2.70
2.80	2.80	2.90	2.90	2.80	2.80	2.90	2.80

The only observed influence of the potassium dicromate in the above dilution was a raggedness of the line between the casein and chloroform after standing ninety-six hours. Occasionally a sample contained detached portions of casein floating in the chloroform. This was considered too small to be a source of error, and did not affect the accuracy of the reading. It simply increased its difficulty.

In another experiment the samples of milk from the same cows as used in the above twenty-four hour test were collected in exactly the same manner as is in vogue in the preparation of composite samples for the Backcock test. One-half tablet of potassium dicromate was placed in the bottom of the bottle and small samples of milk, about 15 cubic centimeters, were added at each milking. After seven and fourteen additions of milk, equivalent to three and a half and seven days, the milks were analyzed with the following results:—

TABLE VI.—*Effect of the method of preserving composite samples of milk with potassium dicromate.*

NO. OF MILK.	COMPOSITE SAMPLES.	
	3.5 days.	7 days.
1.	3.15	3.20
2.	2.50	2.55
3.	2.70	2.70
4.	2.20	2.15
5.	2.90	2.90
6.	2.90	3.00

It would appear from the above data that potassium dicromate can be used as a preservative in the dilution of one tablet to 300 cubic centimeters of milk with safety over limited periods of time. Too long contact gives ragged readings and in the hands of a novice might be read incorrectly. For the highest accuracy and the sharpest readings, samples should not be preserved too long. In the above experiment, ninety-six hours was the limit for a sharp, clean-cut determination. A longer time made the reading difficult. In the composite sample work, the same deduction holds true. Analyses at the end of three and a half days were unaffected and sharply defined, while at the end of seven days they were ragged and read with difficulty.

From the data at hand, it is certain that the best results are obtained on either unpreserved milks or on milks preserved over but short periods of time with potassium dicromate in the above dilution. It is preferred, however, that the determination be made on unpreserved milks, and, in fact, it seems unnecessary to composite samples over long periods of time in the casein determination as is done in the fat determination. Casein is a much more constant constituent and not subject to the extreme daily fluctuations so often observed in the fat of cows' milk.

SUMMARY.

1. Make the test on sweet, unpreserved milk, where practicable.
2. Make the test in duplicate and be sure that the sample of milk is a representative one.
3. Have the temperature of the acetic acid solution and the milk between 65 and 75 degrees F.; 70 degrees is to be preferred and is more accurate.
4. Do not shake the mixture more than twenty seconds.
5. Make sure that the speed of the centrifuge is two thousand per minute for seven and one-half or eight minutes with the diameter of the revolving circle fifteen inches.

6. Allow the tubes to stand for ten minutes before reading.

7. All the following preservatives vitiate the results: formalin, chloroform, toluol, and mercuric chloride.

8. Experiments with potassium dicromate showed that in the proportion of one tablet to 300 cubic centimeters of milk, accurate and sharp results can be obtained where the preservative is in contact ninety-six hours or less. Above that time it is liable to make the casein pellets ragged and irregular.

9. Composite milk samples made by consecutive twelve-hour additions of small portions of milk to one-half tablet of potassium dicromate, as is the usual practice in accumulating milk samples for the Babcock test, gave at the end of three and a half days accurate results. A longer time tends to make the reading ragged.

10. In no case can coagulated milks be used for the test.

INFLUENCE OF METALS ON THE ACTION OF RENNET.

GEO. A. OLSON.

Historically it is impossible for us to trace the initial use of rennet in curdling milk for the preparation of cheese. We do know, however, that milk was curdled and made into cheese as early as 1520 B. C. (Job 10, 10.). The Greeks knew how to make cheese at the time of the writings of Homer. The curdling of milk with the juice of the fig is described by Aristotle and Hippocrates. Caesar also mentions importing cheese from the north. It is doubtful whether or not rennet obtained from calves' or pigs' stomachs was ever known to the people of early times. It is certain, however, that in recent times this agent is used almost exclusively for the curdling of milk in cheese making.

Occurrence.—Rennet is found in the mucous membrane of animals and occurs most abundantly in the stomach of the suckling calf. A substance having some of the properties of rennet has also been found in certain plants.*

Properties.—Rennet is precipitated by lead acetate and salts of heavy metals. It is of colloidal nature, hence it does not diffuse through an animal membrane, but it will, on the other hand, pass through porous porcelain with difficulty.

According to Hammarsten, we learn that the presence of a soluble salt of lime in milk is essential before rennet coagulation can occur.

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* Fig tree (*Fiscus Carica*), artichoke (*Cyuara Scholimus*), melon-tree (*Carica Papaya*), butterwort (*Pinguicula Vulgaris*), etc.

Among other salts that are highly beneficial to rennet coagulation, the following may be mentioned; viz, sodium chloride up to 0.9 per cent, magnesium, zinc, aluminum, beryllium, cadmium, and barium salts.

The following salts have a prejudicial influence on rennet action; viz, sodium flourid, calcium oxalate, ammonium sulfate, (nitrates, carbonates and sulfates), and potassium sulfocyanide.

In studying the influence of different acids upon the rennet action, Pfleiderer* found that hydrochloric, nitric, lactic, acetic, sulfuric, and phosphoric acids had an accelerating influence, the degree of their action decreasing in the order named. Boric acid, according to Mayer,† failed to reveal any influence upon rennet.

Freudenreich‡ found that thymol and formaldehyde vapor retard rennet action. Chloroform and formalin in 0.5 to 1.0 per cent solution have little influence, while according to Benjamin§ chloroform in dilute form is beneficial, but as the strength of the chloroform is increased, a restrictive influence will be observed.

Alcohol, trypsin, bile, gastric juice, heat, and weak solutions of alkalies destroy the action of this ferment. Various kinds of sugar are without influence upon rennet.‖

Effect of temperature.—The temperature is an important factor in rennet coagulation. Below 60 degrees F. rennet has little effect; above 60 degrees F. the action increases, at first slowly and then more quickly until it reaches an optimum at 106 degrees F. Above this point the action diminishes; at 140 degrees F. or over, the action of rennet is destroyed.

Milk which has been boiled does not generally coagulate with rennet. Sterilized and condensed milk fail to respond to rennet action, but on treating them with calcium chlorid, acid or a current of carbon dioxide, the milk resumes its normal property of coagulation. Light has a deteriorating effect on rennet. Ultra-violet rays, radium, (Schmidt and Nielsen) and the actinic rays (Hertzel) have a prejudicial effect upon rennet. This fact, together with the effect of heat, makes it essential that rennet should be kept in a cool, dark place.

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* Pflüg. Archiv., LXVI, 605, 1897.

† Enzymologie, 49.

‡ C. f. Bakt., (II) IV, 309, 1898.

§ Virch. A. CXLV., 30, 1896.

‖ C. Smeliansky, (Arch. Hyg., 59, (1906), No. 3, p. 187-215).

The acidity of milk.—Generally speaking, fresh milk is amphoteric to litmus, that is, it indicates both an alkaline and an acid reaction to this indicator, and in consequence is acted upon very slowly. When milk is made alkaline it fails to respond to rennet action, but if it is again made acid, coagulation will take place. Hammarsten prepared a pure calcium casein which was approximately neutral. This did not coagulate with rennet.

Acid, as well as rennet or pepsin, has the power of coagulating milk and these agents have been employed in all methods of cheese making up to this time. Formerly it was thought that rennet produced acid which in turn produced coagulation, but it has been clearly shown that rennet coagulation is not accompanied by an increase in acidity. Rennet changes the calcium casein of milk and forms a substance called paracasein, which is in a different form from the coagulum formed with acid. The advantage of having acid in the presence of rennet is to hasten the rennet action.

According to Schmidt and Nielsen,* milk, or calcium casein, just alkaline to litmus, is coagulated with rennet.

Effect of water.—Experiments have shown that milk which has been diluted with water does not coagulate so rapidly as does whole milk. In fact enough water can be added to milk to destroy the power of coagulation of the rennet.

Preparation.—In the preparation of commercial rennet extracts from the stomachs of calves not over ten days, and preferably five to six days old, are generally used. The calves from which the stomachs are to be obtained are allowed to go without feed for twelve hours previous to slaughter, in order that the stomachs may be in the best condition. After the stomachs are removed they are washed, sprinkled with salt, then inflated and finally allowed to air-dry. In this condition they are permitted to remain for from three to twelve months. It is said that the quantity of the rennet extract obtained within the limits given increases with the age of the stomach.

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* Schmidt and Nielsen (Upsala Läkareför. Förhandl), n. ser., 11 (1906), Sup. p. 26.

Different methods of obtaining the rennet extract from the dried stomachs have been employed from time to time. Some prefer treating the stomachs with weak solutions of lactic or hydrochloric acid of about 0.1 to 0.2 per cent strength under ordinary temperature conditions. Hammarsten employed hydrochloric acid with the view of transforming the zymogen into the active agent, but for cheese making this method is not so good as the one commonly employed in which the stomach is extracted with a four to five per cent solution of common salt, because acids are detrimental in time to the action of rennet.

Strength.—The strength of the rennet extracts and powders found on the market varies to some extent according to the different methods of preparation and manufacture. A small amount of rennet has the power to coagulate a large amount of milk. Rennet powders have been made where one part was sufficient to coagulate one million parts of milk at a temperature of 35° C. in 40 minutes. The extracts of commerce are tested against one another and diluted until they have an approximate uniformity in strength. Three ounces of good rennet extract should coagulate one thousand pounds of milk in twenty minutes.

According to Fleischmann* the following facts concerning the action of rennet may be given:—

1. With equal amounts of rennet extracts under like conditions of temperature, the time required for coagulation is directly proportional to the quantity of the milk used.

2. The time of coagulation is, under similar conditions of temperature and with equal quantities of milk, inversely proportional to the strength of the rennet used.

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*The Book of the Dairy, tr. by Aikman & Wright, p. 206, 1896.

3. The strength of the rennet extract is, under like conditions of temperature and time of coagulation, directly proportional to the amount of milk coagulated by it.

Uses.—Rennet is used in cheese making for the purpose of coagulating the milk. The time required for the coagulation of the milk ranges from 15 to 120 minutes. In most kinds of cheese, however, sufficient extract is used to coagulate the milk in 20 to 40 minutes. When rennet is added to milk, no physical differences are at first noticed, but such can be detected after a certain lapse of time. The process of coagulation is not gradual but after a certain interval the milk begins to thicken, becomes viscid, then gelatinous and finally becomes firm, pressing out more and more water as the period of time for the setting is prolonged. The amount of rennet used is also a factor to be considered in the setting of the milk. This factor influences to some extent the firmness of the curd. A short period of coagulation is desirable; the time should not be allowed to exceed 20 to 30 minutes in cheddar-cheese making.

The writer is indebted to Mr. A. J. Marschall, Madison, Wis., (inventor of the Marschall rennet test) for the suggestion of the study presented in this paper. Mr. Marschall met with difficulty in using nickel plated dishes for testing the actual strength of a batch of rennet extract prepared by him. He suspected that nickel plating had a prejudicial effect on the activity of the rennet and sought advice from this Experiment Station upon the point. In seeking the cause of Mr. Marschall's trouble, it became necessary to study in detail the influence of various metals on rennet action.

Method.—Milk was used as the medium for the study of the influences on rennet action in all the experiments described. The experiments were conducted by placing milk in contact with various metals for definite periods of time and afterward observing the time required for the coagulation of such milk, with a standard solution of rennet, under uniform conditions.

The strength of rennet used.—Mr. Marschall in his experiments used a solution containing four per cent rennet extract.

The solution used by the writer ranged from five to one per cent of Hansens rennet extract, the latter solution being used in all experiments unless otherwise specified. In all experiments one cubic centimeter of the solution used was added to 50 cubic centimeters of milk.

Method of measuring influence.—The degree of metal influence on rennet action was measured by noting the time required for coagulation. By constantly watching the milk after the rennet had been added, (raising a glass rod through the milk in a slanting position), it was possible to observe approximately the time when the milk just thickened. The coagulating point is not sharp, but with a little practice one is able to fix a standard which will give a very close agreement in duplication, viz, within five seconds under like conditions. The difference of time is comparatively small and practically unimportant in comparison with the differences observed with different metals against each other and the controls, where differences ranged from minutes to hours.

Kinds of metals.—Copper, zinc, lead, nickel, aluminum, tin, iron, platinum, and different kinds of glass were tried, mainly to learn what influence, if any, they had on the rennet action and whether or not this influence was characteristic in case of each metal. All the metals used in the experiments, with the exception of the iron and platings, were practically pure. The results of these tests are presented in the following tables.

Explanation of tables.—In the tables given in the following pages the metals used in the various experiments are placed in the left column. The hour, reading across, represents the lapse of time in which the milk was in contact with the metal. The temperature following the hour is the temperature at which the milk was kept after the rennet was added. Coagulation denotes the time required for the milk to set after the addition of rennet, at the specific temperature and hour. By acid is meant the per cent of lactic acid the milk contained at the given hour and at the time the rennet was added.

Experimental results.—A few tests were subsequently made by Mr. Marschall in his laboratory to determine whether it was the rennet extract or the milk which was acted upon directly by the nickel plating. He found that milk which came in contact with nickel plating required a much longer time for coagulation by rennet than the same milk kept under normal condition. The nickel plating had no influence upon the rennet solution directly. Preliminary experiments were made in order to determine whether Mr. Marschall's results could be duplicated. The following table shows the results.

TABLE I.—*Preliminary study on influence of metals on rennet action.*

No.	Metals.*	TEMPERATURE	COAGULATION.	
		Degrees F.	Minutes.	Seconds.
1	Glass beaker	100	4	10
2	Platinum dish	100	4	10
3	Solid nickel dish (smooth)	100	4	10
4	Glass beaker	88	5	30
5	Glass beaker containing powdered nickel	88	5	30
6	Glass beaker	94	5	....
7	Glass beaker containing a nickel plated copper cylinder	94	5	....
8	Glass beaker	92	4	30
9	Solid nickel dish	92	4	30
10	Glass beaker containing nickel plated copper cylinder	92	20	30

*Nos. 8, 9, and 10 were allowed to stand two hours before adding rennet. Nos. 1-7 inclusive were tested immediately after coming in contact with the metal.

Effect of acidity.—Generally speaking, we have seen that acids of various kinds accelerate rennet coagulation, (see page 135). It was thought possible, however, that the addition of an acid to milk, which comes in contact with a metal for some time, forms salts that would be prejudicial rather than beneficial to rennet action. In testing this point different amounts of acid were added to milk in contact with pure nickel dishes. The results obtained confirm the commonly accepted view that an increase in acidity within certain limits hastens rennet action. No differences in the time of coagulation in the nickel dishes and the controls were observed, because the acidity of the milk used was rather high to begin with (0.216 per cent) and the rennet solution used was too strong (1 cubic centimeter of a 5 per cent solution in 50 cubic centimeters of milk). It was found desirable to work with milks containing less than 0.2 per cent acidity.

Owing to the development of other facts the question of the effect of acidity on rennet action will be discussed in connection with the influence of the condition of the metal in the latter part of this paper.

Electrolysis.—The possibility of electrolysis as a factor in rennet retardation could only be determined under conditions where an electric current is developed. A series of experiments were made where one metal was brought in contact with another and the two different metals were submerged in the milk in combination, such as nickel and copper, (representing the nickel-plated copper cup), iron and tin, (representing a rusty can), a nickel-plated copper cylinder, and a nickel-plated nickel dish. One cubic centimeter of a solution containing 2.5 per cent of rennet extract was used for every 50 cubic centimeters of milk. An example of the results of this work is as follows:—

TABLE II.—*Influence of metal combinations on rennet action.*

MATERIAL.	TWO AND FIVE-TENTHS HOURS, 87° F.		FIVE HOURS, 87° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Nickel-plated copper cylinder	46	.176	100	.180
Nickel plated copper cylinder washed	35	.185	62	.188
Copper and nickel	35	.180	42	.180
Tin and iron	23	.185	23	.185
Control (glass)	20	.194	20	.194

The data given in the above table clearly show that metals do influence the action of rennet. The influence of the unwashed nickel-plated copper cylinder required from two and one half to five times as much time for coagulating the same milk as was necessary for the control. The washed nickel-plated copper cylinder was not so marked as the unwashed one, due to either finely divided nickel or nickel salts being removed. The tin and iron combinations were less marked in their influence when compared with the control than any of the others in the experiments. It is of importance to note the per cent of acid in the milk with each combination. The one having the least acidity required also the longest time for coagulation.

Although appreciable retardations were observed in the above tables, the question of electrolysis as a factor is left unsettled, as it was felt that the experiments should be directed in an elemental way so that there would be the effect of only one metal to consider.

Effect of different metals separately.—At first an average lot of mixed milk, representing different breeds, was tried and afterwards the milk from individual cows. It was thought that by introducing the milk from individual cows of different breeds some constant factor or factors might be attained which would throw some light upon the character and extent of the influence.

The greater number of experiments were carried on with iron. This metal comes in contact with the milk more than any other metal, and from a practical standpoint was considered most important. To illustrate the influence of different metals on rennet action the following tables are submitted:—

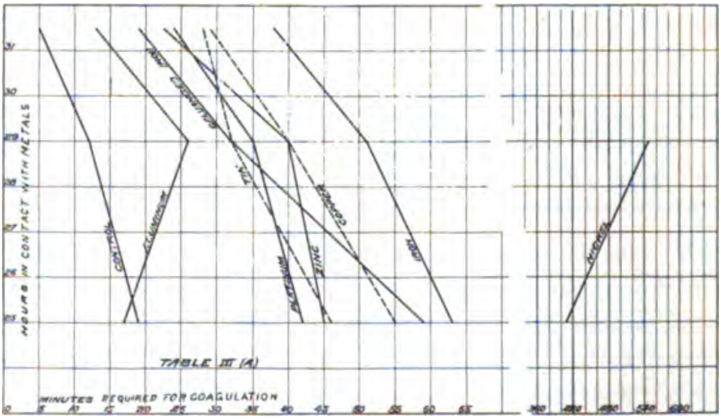

Fig. 20.—Influence of different metals upon rennet action with mixed milks.

TABLE III.—*Influence of different metals on rennet action.*

(A). *Mixed milk.*

MATERIAL.	TWENTY-FIVE HOURS, 87° F.		TWENTY-NINE HOURS. 87° F.		THIRTY-ONE AND ONE-HALF HOURS, 87° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Glass (control).	19	.207	12	.270	5	432
Platinum	42	.180	35	.189	24.5	.208
Tin...	46	.171	37	.180	28	.207
Copper	55	.180	40	.189	29.5	.198
Nickel	420	.167	510	.171	....	....
Iron	63	.162	51	.171	38	.180
Aluminum	17	.180	26.5	.198	14	.243
Zinc	45	.171	40	.171	22.5	.216
Galvanized iron	58	.180	35	.207	19	.243

(B). *Milk from Holstein cow.*

MATERIAL.	SEVENTEEN HOURS. 89° F.		TWENTY-FOUR HOURS. 91° F.		TWENTY-EIGHT HOURS. 91° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Glass (control)..	16	.207	5.5	.288	4.66	.387
Aluminum	18	.180	8.5	.234	9.	.315
Lead.............	17	171	9.	.225	7.	.306

(C). *Milk from Jersey cow.*

MATERIAL.	SEVENTEEN HOURS. 89° F.		TWENTY-FOUR HOURS. 91° F.		TWENTY-EIGHT HOURS. 91° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Glass (control)..	25	.198	17	.225	10	.288
Aluminum	28.5	.189	not in. 30	.225	21	.288
Lead....	27	.180	not in. 30	.217	21	.214

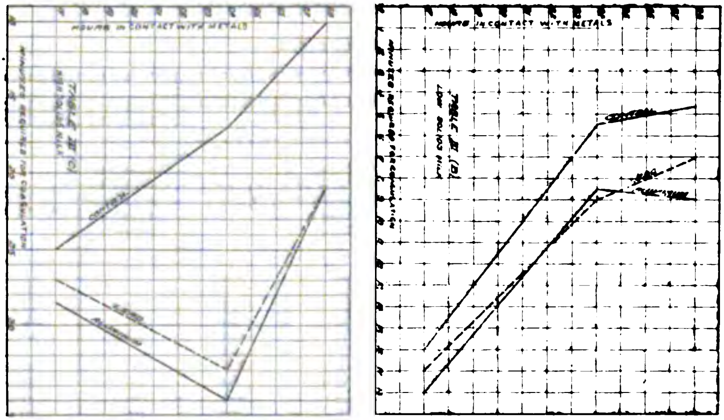

Fig. 21.—The retarding influence of lead and aluminum on rennet action with milk of high and low solids.

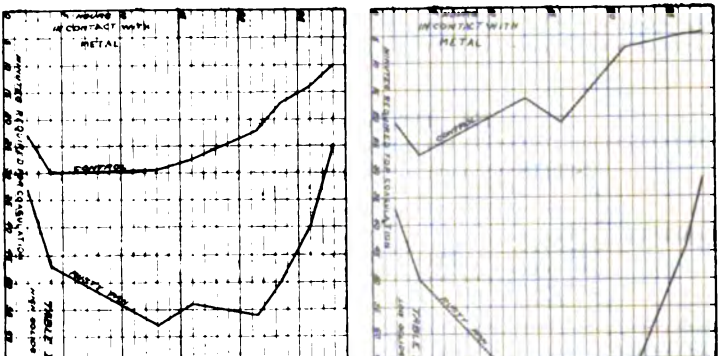

Fig. 22.—Retarding influence of rusty pans on rennet action with milks of high and low solids.

(D) *Milk from Holstein cow.*

MATERIAL.	TWO HOURS, 89°F.		FOUR HOURS, 87°F.		THIRTEEN HOURS, 90°F.		SIXTEEN HOURS, 90°F.		TWENTY-ONE AND ONE-HALF HOURS, 91°F.		TWENTY-THREE AND ONE-HALF HOURS, 91°F.		TWENTY-SIX HOURS, 91°F.		TWENTY-EIGHT HOURS, 91°F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Glass (control)........	21	.180	27	.180	16.5	.198	21	.198	7.5	.234	5.5	.2[illegible]8	5	.324	4.66	.387
Iron dish..............	37	.172	50	.153	71	.153	105	.135	70	.153	60	153	44	.180	31	.198

(E) *Milk from Jersey cow.*

Glass (control)........	23	.216	30	.216	29.5	.207	27	.198	22	.216	17	.225	14	.243	10	.288
Iron dish..............	33	.189	47	.189	58	.180	54	.171	56	.180	50	.189	40	.207	25	.234

TABLE IV.—*Influence of rusty pan on rennet action.*

MATERIAL.	ONE HOUR, 87° F.		ONE AND ONE-HALF HOURS, 87° F.		TWO HOURS, 87° F.		THREE HOURS, 87° F.		EIGHT HOURS, 88° F.		SIXTEEN HOURS, 88° F.		TWENTY-FOUR HOURS, 88° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Control......	23.5	.171	22	.176	20	.176	20	.176	19	.176	17.5	.176	14	.176
Rusty pan..	24.	.158	23	.167	22.5	.167	23	.162	25	.171	27.	.171	30.5	.171

MATERIAL.	TWENTY-FIVE HOURS, 86° F.		TWENTY-SIX HOURS, 87° F.		TWENTY-SEVEN HOURS, 88° F.		TWENTY-NINE HOURS, 87° F.		THIRTY HOURS, 87° F.		THIRTY-ONE HOURS, 87° F.		THIRTY-TWO HOURS, 87° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Control......	11.5	.207	8.25	.207	8	.225	6	.270	4.5	.297	3.5	.396	2	.459
Rusty pan..	26	.162	21.	.180	22.5	.180	18.5	.180	16	.198	10.5	.216	9	.225

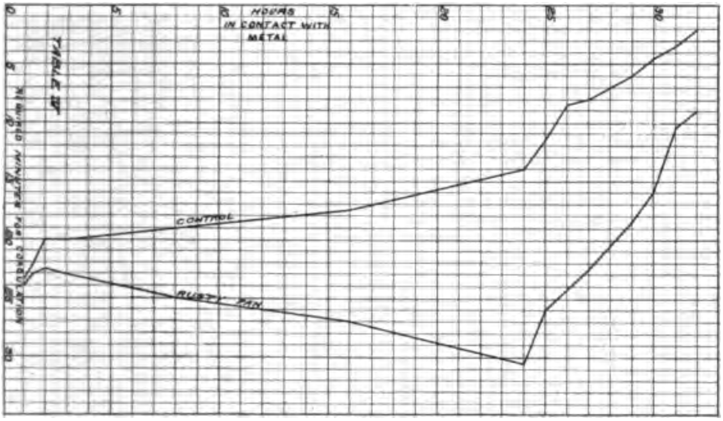

Fig. 23.—Influence of rusty pan on rennet action with average factory milk.

It will be noted from Table III that the separate metals had a prejudicial effect on rennet action similar to those used in combination. The most striking influence observed was with the milk in contact with pure nickel, (Part A), which required from twenty-two to forty-five times longer to coagulate than was necessary for the milk in the control. With the single exception of aluminum, (Table A, 25 hour period), each of the metals tried produced a prejudicial influence on the rennet action. When the milk from different breeds was considered independently, the only difference noticeable was that a milk containing a high per cent of solids required a longer time for coagulation than one deficient in this respect. In some cases this difference was very striking. In regard to the time of coagulation the milk from the same animal differed from day to day.

In parts (D) and (E) note the fall and rise of the acid in the milk in contact with the iron. This is also true to a less extent with the control.

Effect of rusty cans.—We know from the data in preceding tables that both tin and iron have a prejudicial influence on rennet action. The question of whether or not rusty cans would have a similar influence was now studied. A part of the milk was placed in a rusty tin pan (with about fifteen rust spots in the bottom of same) and the remainder was kept in a Jena glass for control. The following data were obtained:—

Every time that this experiment was repeated the milk kept in the rusty pan gave evidence of a retarding influence on the rennet action compared with that in the glass beaker. What has been said concerning the acid in the preceding experiments also holds good here. Wherever there has been a retarding influence on the rennet action there has also been a retardation of the acid development as well. Milk is quite frequently hauled to creameries and cheese factories in poorly tinned or rusty cans. The question may be raised, what effect, if any, have such cans upon the milk delivered to the factory? We know from the above data that nickel, copper, iron, rusty pans, etc., have a strong prejudicial effect upon rennet action. As milk is hardly ever kept in nickel or nickel-plated utensils, the retarding effect of this metal would, therefore, have little significance from a practical standpoint. Copper, however, is used more or less extensively in the form of heating discs, in continuous pasteurizers in creameries, and as kettles in the Swiss Cheese factories.

Influence of glass.—It will be noted that in all previous experiments the results obtained in the glass vessels were considered normal. Lead, tin, platinum, and aluminum, when compared with glass, had less effect on rennet action than any of the metals tried.

In order to get a check upon glass other substances than metals were substituted, like paraffine and beech wood.

Paraffine is practically an inert substance and was used to coat paper boxes in which the milk was placed. The coating of paraffine was about an eighth of an inch thick.

Wooden scoops made from beechwood were used. These scoops are used in Swiss Cheese factories and are typical to some extent of the wooden utensils used abroad.

Platinum, although a metal, was run in this series in order to get a check upon the paraffine and beechwood. Milk which was kept in an enameled pail was also tried. The results are as follows:—

TABLE V.—*Influence of glass on rennet action.*

MATERIAL.	TWELVE HOURS, 90° F.		TWENTY-ONE HOURS, 91° F.		TWENTY-THREE HOURS, 92° F.		TWENTY-SIX HOURS, 92° F.	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Glass	19.5	.162	16	.189	14	.216	3	.351
Paraffine	20	.162	17	.180	20	.198	5	.297
Wood	20	.162	18	.207	16.5	.216	5	.297
Platinum	21	.162	21	.180	23	.180	9	.225
Enameled pail	21	.162	17	.171	....	....	....	....

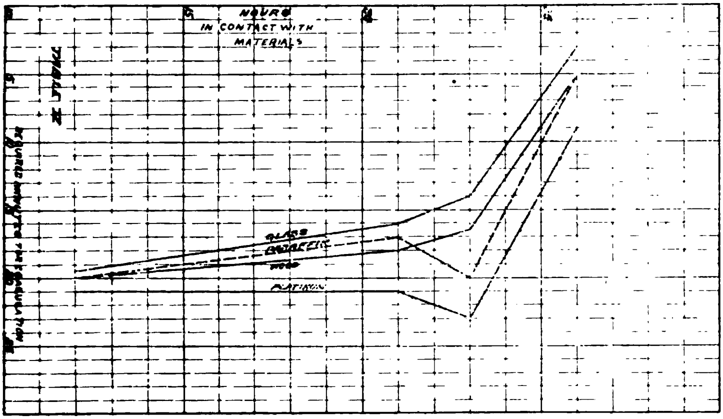

Fig. 24.—Influence of inert substances (paraffine, platinum, and wood) on rennet action with milk.

It will be observed from the above data that when glass is considered normal the other substances have a prejudicial influence upon rennet action. This seems hardly possible when we consider the fact that paraffine is an inert substance. Indeed it is as difficult to concede that platinum has any prejudicial influence, yet all the data at hand seem to indicate that it has. Glass is undoubtedly beneficial to rennet action and hence accelerates coagulation, leaving a wider margin on the influence of the metals than naturally takes place. This explanation will decrease the value of the influence of platinum on the rennet action and what changes take place in the paraffined box are probably normal changes continually occurring in the milk.

Influence of different makes of glass.—From the data in the foregoing experiment it is evident that glass produces an accelerating influence upon rennet coagulation. Since there are different kinds of glass made up of various mixtures of alkalies with either calcium or lead silicates, the special kinds used in these experiments might differ in their effect on milk in regard to the point under consideration, and it is desirable, therefore, to study the action of glass of different composition in this respect.

There are three distinct groups of glass, soda (silicate of soda and calcium), potash (silicate of potash and calcium), and lead glass (silicate of potash and lead). As representative of the three distinct groups of glass the following were examples: for potash, Jena, and resistance; for soda, common glass; and for lead, milk bottle.

Milk was placed in the containers representing the different makes of glass which were tested against one another with the following results:—

TABLE VI.—*Influence of different makes of glass on rennet action.*

MATERIAL.	EIGHTEEN HOURS. 90° F.*		TWENTY-ONE AND ONE HALF HOURS 95° F.*		TWENTY TWO HOURS. 87° F.†		TWENTY-THREE HOURS. 89° F.†	
	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.	Time required to coagulate in minutes	Acid in per cent.	Time required to coagulate in minutes.	Acid in per cent.
Milk bottle......	2	.432	....	....	20	.180	20.5	.252
Jena glass........	16.5	.180	7	.225	34.5	.180	30	.216
Resistance glass	17.5	.180	7	.225	37	.180	26	.207
Common glass ..	13.5	.180	4.5	.297	29.5	.180	21.5	.243

* Milk No. 1. † Milk No. 2.

It is apparent from the above data that glass is beneficial and in consequence accelerates rennet action. The degree of influence is directly dependent upon the character of the glass. Another important fact is the rapidity of the acid development in the milk which stood in the soft makes of glass compared to that in the hard kinds. To be certain of this point the bottles were thoroughly washed and sterilized and then tried against one another with corresponding results as described above.

Influence of nickel and acid on rennet action.—When the effect of acidity of the milk was first studied no difference in the time of coagulation of the milk in the nickel dish and that kept in the glass beaker was observed. The high acidity of the milk and the strong rennet solution used undoubtedly explain this result.

While studying the influence of different little dishes on rennet action it was observed that the retardation materially increased with the number of times the nickel dish was used.

In view of these facts an experiment was conducted to study the influence on rennet action of nickel dishes, which were little or much used, with milk containing varying amounts of acid. The milk was allowed to stand in the nickel dishes for four and three-quarters hours before the rennet was added. In the following table dishes Nos. 1 and 2 were nickel-plated copper, the same ones that Mr. Marschall used and found to be prejudicial in his rennet tests; Nos. 3, 4, and 5 were pure nickel dishes, the last of which had been used very little.

TABLE VII.—*Influence of nickel and acid on rennet action.*

MATERIAL.	FOUR AND THREE-FOURTHS HOURS, 95° F.				
	Time required to coagulate in minutes.	Acid.			
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.
Control	11.00	.153	....	.153	.162
Nickel plated cup No. 1	14.16	.153	.005	.158	.162
Nickel plated cup No. 2	17.50	.153	.010	.163	.171
Nickel dish No. 3	46.66	.153	.016	.169	.162
Nickel dish No. 4	9.75	.153	.031	.184	.171
Nickel dish No. 5	9.08	.153	.036	.189	.180

The most striking retardation was with the milk kept in dish No. 3, the one most used.

It would appear from the results given in the foregoing table that the surface of the dish is an important factor. To make sure of this point, the order of the dishes was reversed in such a way that nickel dish No. 3 contained the milk having the highest acidity. The milk was allowed to stand in the dishes for four hours before testing. The results are as follows:—

TABLE VIII.—*Influence of acid in connection with nickel on rennet action.*

MATERIAL.	FOUR HOURS, 90° F.				
	Time required to coagulate in minutes.	Acid.			
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.
Control	9.33	.171	....	.171	.180
Copper nickel-plated dish No. 1	13.83	.171	.021	.192	.180
Nickel-plated dish No. 2	48.66	.171	.025	.196	.207
Nickel dish No. 3	71.66	.171	.031	.202	.180
Nickel dish No. 4	15.00	.171	.010	.181	.180
Nickel dish No. 5	14.33	.171	.015	.186	.198

Here again, as in the first case, the milk which had stood in dish No. 3, (the dish most used and containing most acid), required the longest time for coagulation. The results of this experiment tend to show that the condition of the dish has considerable to do with the action of the rennet, since increasing the amount of acid in milk, under ordinary conditions, hastens coagulation.

In order to determine whether or not the surface of one dish responds to acid action more readily than another, old and new nickel dishes were run parallel with Jena beakers containing equivalent amounts of acid.

It will be noted from the results below that the new dishes were less prejudicial to rennet action than the old ones. This is in all probability due to increased surface of the old nickel dishes, the new ones being burnished, and, therefore, having less surface.

Other things being equal, the time required for the same milk to coagulate varies, more or less, according to the condition of the surface of the metal in question.

TABLE IX.—*Influence of surface of nickel dishes on rennet action.*

(A).

MATERIAL.	FOUR HOURS, 90° F.				
	Time required to coagulate in minutes.	Acid.			
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.
Control	7.41	.171	....	.171	.180
Jena	7.25	.171	.010	.181	.198
New nickel	8.08	.171	.010	.181	.198
Old nickel	9.16	.171	.010	.181	.198
Jena	6.33	.171	.021	.192	.216
New nickel	6.33	.171	.021	.192	.207
Old nickel	23.33	.171	.021	.192	.207
Jena	3.16	.171	.031	.202	.225
New nickel	5.66	.171	.031	.202	.216
Old nickel	12.83	.171	.031	.202	.216
Jena	2.16	.171	.041	.212	.243
New nickel	4.75	.171	.041	.212	.225
Old nickel	9.53	.171	.041	.212	.234

(B).

MATERIAL.	FOUR HOURS, 88° F.				
	Time required to coagulate in minutes.	Acid.			
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.
Control	8.16	.171	....	.171	.189
Jena	4.16	.171	.052	.223	.261
New nickel	4.66	.171	.052	.223	.252
Old nickel	11.33	.171	.052	.223	.252

Influence of metals in a final divided state.—It has been said that the condition of the surface of a metal is an important factor and undoubtedly is a cause, at least in part, for rennet retardation. By reducing platinum or copper salts with zinc, the resulting metals (platinum black and copper black) are obtained in a finely divided state and therefore offer a much larger surface.

Reduced copper, platinum and iron were studied in two ways. First, the milk was treated with the respective agents, stirred and the rennet solution added immediately (part A) and second, the milk treated with these agents was allowed to stand some time before the addition of the rennet (part B).

TABLE X.—*Influence of reduced metals on rennet action.*

(A)	EIGHTEEN HOURS 90° F.		(B)	TWENTY-THREE HOURS 93° F.	
	Time required to coagulate in minutes.	Acid in per cent.		Time required to coagulate in minutes.	Acid in per cent.
Platinum	8.	.288	Platinum	23.	.207
Copper	7.	.288	Copper	36.5	.207
Iron	8.	.288	Iron	18.	.252
Control	6.5	.288	Control	9.	.270

Little or no effect was observed in the first part (A) of the above experiments where the rennet had been added immediately. On the other hand, the milk which had been allowed to stand some time before adding the rennet showed striking retardations.

Influence of the salt of the metals.—In all preceding experiments the influence of various metals themselves on the action of rennet was studied. Wherever a prejudicial effect on the rennet was observed in the experiments, it is also possible that the retarding influence may in part be due to the formation of salts of the metals. Salt formation was noticed in a striking manner with the milk which had been kept in the iron dishes. The nickel, copper, and other metals were also partly dissolved by the action of the acid of the milk.

Chemically pure salts of nickel and copper lactates were made by dissolving these metals in lactic acid and recrystalizing the salts repeatedly. The prepared salts, to the amount of 0.1 gram, were each dissolved in 100 cubic centimeters of lactic acid solution of a known strength. Under similar conditions, equal quantities of acid solution (same strength) and acid salt solution were added to like quantities of milk. The milk containing the acid solution was used as a check against the milk containing the salt solutions. The results are as follows:—

TABLE XI.—*Influence of the salts of the metals.*

(A)	Five hours 90° F.			
	Total cubic centimeters.	Time required to coagulate in minutes.	Acid in per cent.	Salt in grams.
Control	50	10.16	.162	....
1 cc. water	51	10.23	.162	....
1 cc. copper solution	51	11.33	.162	.001
1 cc. nickel solution	51	14.08	.162	.001
2 cc. water	52	9.46	.162	....
2 cc. copper solution	52	11.75	.162	.002
2 cc. nickel solution	52	16.50	.162	.002
3 cc. water	53	9.00	.162	....
3 cc. copper solution	53	12.33	.162	.003
3 cc. nickel solution	53	19.33	.162	.003
5 cc. water	55	8.08	.162	....
5 cc. copper solution	55	15.50	.162	.005
5 cc. nickel solution	55	29.50	.162	.005

(B)	Four hours, 90° F.					
	Time required to coagulate in minutes.	Acid.				
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.	Salt in grams.
Control ...50 cc.	15.00	.171	....	.171	.180	....
5 cc. water +50 cc.	5.75	.171	.052	.223	.243	....
5 cc. copper +50 cc.	4.41	.171	.052	.223	.243	.005
5 cc. nickel +50 cc.	8.83	.171	.052	.223	.243	.005
10 cc. water +50 cc.	7.41	.171	.103	.274	.288	....
10 cc. copper +50 cc.	14.08	.171	.103	.274	.293	.010
8⅓ cc. nickel +50 cc.	10.50	.171	.086	.257	.279	.0083

(C)	Five and one-half hours, 88° F.					
	Time required to coagulate in minutes.	Acid.				
		Initial in per cent.	Amount added in per cent.	Total in per cent.	Final in per cent.	Salt in grams.
Control ...50 cc.	16.00	.171	....	.171	.180	....
5 cc. water +50 cc.	7.50	.171	.052	.223	.234	....
5 cc. copper +50 cc.	5.66	.171	.052	.223	.243	.005
5 cc. nickel +50 cc.	11.16	.171	.052	.223	.234	.005
10 cc. water +50 cc.	10.08	.171	.103	.274	.284	....
10 cc. copper +50 cc.	18.83	.171	.103	.274	.297	.010
8⅓cc. nickel +50 cc.	12.25	.171	.086	.257	.279	.0083

From the above data, it will be noted that the nickel salt, as in the case of the pure nickel dishes, had the most pronounced influence on rennet action.

Comparative study of the ash content.—All the milk which had been allowed to stand in iron dishes for several hours had a peculiar blue-grey color, indicating the presence of iron in solution. This and the control milk was reduced to ashes in several instances, in order to determine whether or not the iron causing this perceptible coloring was large enough in quantity to be weighed. The per cent of insoluble ash was also determined.

TABLE XII.—*Ash determinations of some of the milks used.*

CONTROL.		IRON DISH.		CONTROL.		IRON DISH.	
Grams.	Per cent.	Grams.	Per cent.	Per cent soluble.	Per cent insoluble.	Per cent soluble.	Per cent insoluble.
0.3778	0.74	0.3878	0.76	28.67	71.33	28.00	72.00
0.3586	0.70	0.3870	0.76	40.77	59.23	37.72	62.27
0.3528	0.69	0.3534	0.69	22.08	77.92	15.91	84.09
0.1406	0.70	0.1437	0.71	38.48	61.52	35.21	66.79
0.1438	0.71	0.1538	0.76	18.92	81.08	24.47	75.53
0.4100	0.80	0.5000	0.98	37.07	62.93	35.84	63.16

The above results suggest that weighable amounts of iron are dissolved and enter into the milk under the conditions stated. In preceding experiments we have already seen that the retarding influence of iron upon rennet action (Tables III, p. 145, and IV, p. 146) is increased with the length of time the milk is kept until a certain per cent of acid has been developed. The acid formed undoubtedly acts more rapidly upon the metals than the ash constituents contained in the milk and may in part be the cause of the rennet retardations. Not only is this true with iron, but nickel, copper, etc., as well, are all soluble in lactic acid and give rise to metal lactates in the milk. With one exception the milk kept in the iron dish contained the highest per cent of insoluble ash.

In addition to the retarding influence of the metal lactates on rennet action, we have associated therewith taints or off flavors, a subject which is being studied.

RÉSUMÉ.

In the introductory part a large number of conditions influencing the action of rennet on milk are noted. To these should be added the following:—

(1) Different metals; (2) the surface of metals; (3) metals in a finely divided state; (4) copper and nickel lactate; (5) different kinds of glass.

The direct cause for rennet retardations by metal influences has not been ascertained. Up to this time only a few facts which have been brought out in the work discussed in the preceding have been considered.

The data given show beyond a doubt that metals in some way delay the coagulation of milk with rennet. Different milks respond differently; the most striking retardations were observed with pure nickel. The retardations that are most doubtful are those observed with platinum and tin. It is hardly conceivable that salts of platinum or tin should be formed by the acid of the milk. When tin is treated with lactic acid, a slight visible corrosion takes place, while on the other hand, platinum remains uncorroded.

Attention is called to some peculiarities observed in these trials. The tendency for milk to keep a longer time in platinum dishes than in wood, paraffine, or glass dishes, and the gradual rise in acidity, together with a retarding influence of the metals on rennet action, suggests the idea that platinum does in some way influence rennet action. It is known that by conducting beer from the filter press to the racking machine by means of tin pipes, a turbidity in the beer will be likely to occur. This has been proved by direct experiments and still the amount of tin dissolved therein is very likely so small that it is doubtful whether it could be detected except by the most delicate tests, such as the spectroscope. On similar grounds, platinum should be more difficult to detect.

It has been stated that milk is likely to come in contact with iron in rusty cans or poorly tinned utensils in both the creamery and cheese factory. If the cans used for hauling milk to the creameries and cheese factories are carefully inspected, it will be observed that some are poorly tinned or worn off so as to expose some of the iron. The quality of the milk will to a large extent depend upon the condition of utensils in which the milk is kept or hauled to the factory. The degree of influence of iron on milk will depend largely upon the temperature, the length of time kept, and the amount of surface.

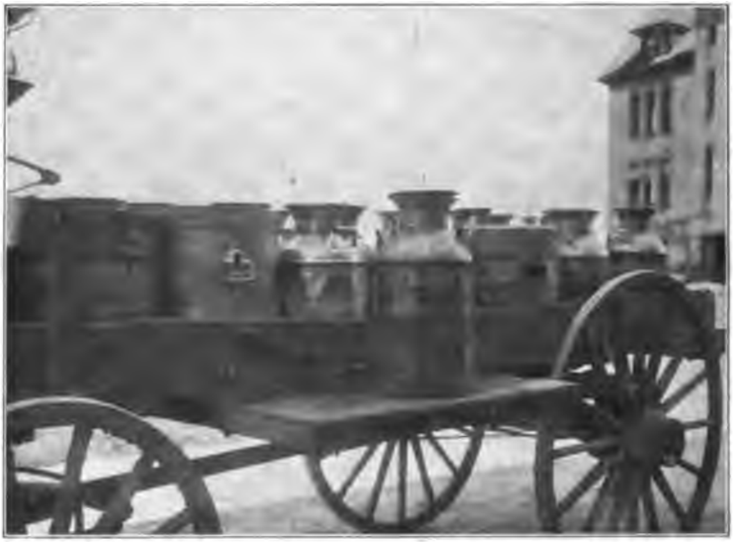

Fig. 25.—Wagon load of factory milk cans in actual use. Nearly all of these are unfit and should be rejected.

The accompanying illustration shows a wagonload of cans which were in a poor condition, yet the milk shipped in them was accepted by the factory from day to day. This particular wagonload is only an example of many as bad, if not worse, that may be found at most factories. The creamery to which the milk was delivered did not receive milk on Sundays, and the quantity of milk brought in on Monday was generally twice as large as any of the other days, and consequently required twice the number of cans. Among the large number of cans required for Monday's shipment, there were naturally more poor ones. The following cut shows two of these cans for Monday's lot of milk. One of these cans had been used for thirteen years and when closely examined, contained no less than forty soldered holes, some of which were covered with lead patches over two inches in diameter.

Of course this is an extreme type of poor cans. Milk kept over night in cans of this kind when treated with rennet, would require from three to forty minutes longer to coagulate than milk kept in good ones.

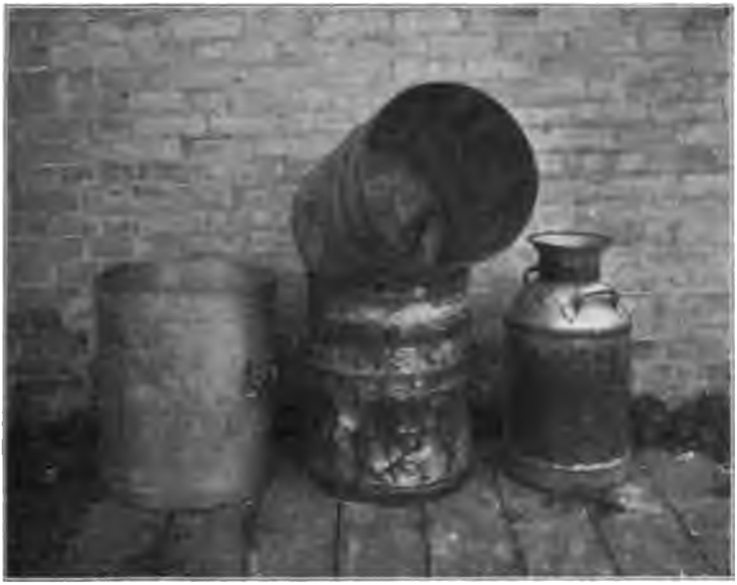

Fig. 26.—Cans like the three to the right would injure the milk for cheese making.

The reason for a slow or retarded action of rennet which cheese makers have often experienced possibly may be attributed to the acid action upon iron in cans of the above type, and not entirely to the amount of salts present in the milks, as was formerly supposed.

One more fact should be emphasized. Milk having two-tenths or more acidity is regarded unfit for some creamery purposes; at the same time it is possible to accept from patrons milk which really has developed more than two-tenths acidity, and which cannot be revealed by either the Mann's or Farrington alkaline-tablet test, because the acid is partly neutralized by the iron. This is an important matter, for in order to make the highest quality of cheese or butter, it is as necessary to have all utensils in good condition, as to work with milk of good quality under sanitary factory conditions.

MISCELLANEOUS CHEMICAL ANALYSES.

F. W. WOLL AND GEO. A. OLSON.

During the past few years a number of different materials have been analyzed in the chemical laboratory of our Station which have not been previously reported. It is proposed to present in this article the results of such miscellaneous chemical work that has accumulated, and to discuss them briefly from a chemical point of view. The analyses included examinations of four-year old cheese made from milks of different fat contents; skim milk cheese; soy beans; salty milk; human milk, and factory by-products.

A. ANALYSES OF CHEDDAR CHEESE FOUR YEARS OLD.

Six cheddar cheese were made from 200 pounds of milk containing from 0.1 per cent to 5 per cent of fat. These cheese were allowed to cure for four years before analyses were made.

The cheese made from skim milk was so hard that it required the use of a saw in order to obtain a sufficiently large sample for analyses. The cheese containing one and two per cent of fat had the appearance of green cheese, and seemed to have digested very little considering the length of time which they had been kept. The cheese made from the three per cent milk had all appearances of a good cheese, while the two cheese made from milks containing 4 and 5 per cent fat looked like ordinary well-cured cheese.

The quality of the cheese improved with the richness of the milk up to four per cent of fat and it was difficult to judge whether the cheese from the four or five per cent milk was the better. Nearly all interested in the scoring of the cheese were inclined to place the cheese from the four per cent milk first.

The approximate shrinkage of the cheese was as follows:—

TABLE I.—*Shrinkage of cheese four years old.*

	CHEESE MADE FROM MILK CONTAINING					
	One-tenth per cent fat.	One per cent fat.	Two per cent fat.	Three per cent fat.	Four per cent fat.	Five per cent fat.
Initial weight, pounds	11.0	13.4	16.0	18.4	21 8	24.8
Weight after four years, pounds	6.0	11.6	14.0	15.0	18.5	20.5
Per cent shrinkage	45.5	18.0	12.5	18.5	15.1	17.3

The above data show that the 0.1 per cent milk cheese shrunk 2.5 times more than any of the others. The cheese made from the 1.0 to 5.0 per cent milk, inclusive, were fairly uniform as regards loss in weight during the four years.

The chemical composition of the cheese will be seen from the following table:—

TABLE II.—*Percentage composition of cheddar cheese four years old.*

	CHEESE MADE FROM MILK CONTAINING					
	One-tenth per cent. fat.	One per cent fat.	Two per cent fat.	Three per cent fat.	Four per cent fat.	Five per cent fat.
Water	39.28	35.50	33.21	29.97	28.78	28.52
Protein	50.44	42.50	36.22	31.25	27.38	24.50
Fat	0.93	18.74	22.89	31.67	38.49	42.39
Ash	5.74	4.82	4.94	4.03	4.28	4.12

The above results show that as the cheese increases in richness, the water, protein, and ash decrease. The high water content in the hard, seemingly dry cheese from separator skim milk is remarkable.

The soluble nitrogen compounds in the cheese examined were determined by the method of analysis adopted at the

New York Experiment Station, Geneva,* the albumoses, peptones, (phosphotungstic acid precipitate), and ammonia by the methods employed at the Wisconsin Experiment Station†. Ammonia was also determined by the barium carbonate method‡. The number of cubic centimeters $\frac{N}{10}$. Na(OH) required to neutralize the acidity of the extract with phenolphthalein as an indicator is also given.

TABLE III.—*Soluble nitrogen compounds in cheese.*

Made from milk containing:	c. c. $\frac{N}{10}$ Na(OH)	PER CENT SOLUBLE NITROGEN EXPRESSED IN THE FORM OF—						
		Albumen.	Paranuclein.	Albumoses ($ZnSO_4$)	Peptones (phosphotungstic.)	Ammonia (MgO)	Ammonia ($BaCo_3$)	Amide (MgO basic.)
One-tenth per cent fat..	115	....	2.68	1.26	4.68	4.76	4.32	22.41
One per cent fat	70	....	1.77	1.44	5.06	3.06	2.82	25.03
Two per cent fat	53	0.69	1.38	1.80	6.14	2.35	2.49	26.16
Three per cent fat	70	0.72	1.24	2.10	6.26	4.48	4.00	29.72
Four per cent fat	60	0.74	2.03	6.45	8.81	3.69	2.95	19.59
Five per cent fat	70	0.72	2.35	5.22	9.30	4.50	4.30	22.10

It will be noted from the results presented in this table that the amount of water-soluble nitrogen appears to increase with the richness of the cheese, and that the albumoses and peptones are much higher in cheese from four to five per cent milk than the cheese made from milk of a lower fat content. We further note that the albumen and the paranuclein form a very small part of the water-soluble nitrogen, this being made up largely of so-called end-products, viz, amides and ammonia.

B. ANALYSES OF SKIM MILK CHEESE.

Three skim milk cheese were made by Dr. G. Ellbrecht, State Dairy Instructor of Denmark, at our dairy school during the winter of 1905–1906, according to the Danish method of cheese making. These cheeses were allowed to cure from eight to twelve weeks, and were then analyzed.

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* Bul. 215, p. 85.

† 16th Ann. Rept., p. 161 (1897).

‡ E. Hart, Zeitschr. f. Physiol. Chem. 33, 347, (1901).

Cheese No. 1 (twelve weeks old), was made from tainted skim milk, containing 0.9 per cent fat and 0.25 per cent lactic acid. This cheese cured rapidly and was well broken down when analyzed. It was, however, too sour for marketable purposes. Cheese No. 2 (eleven weeks old), was also made from tainted milk having 1.0 per cent fat. It had about the right texture, but was also a little too sour. Cheese No. 3, (eight weeks old), was made from rather good skim milk containing 1.0 per cent of fat.. It was of excellent quality.

It was not possible to use either butter milk or starter in the making of the above described cheese, because of the high acid content in the skim milk at the time it was placed in the vat.

The results of the chemical analyses made of the cheese are given in the following table:—

TABLE IV.—*Analyses of skim milk cheese; in per cent.*

	No. 1.	No. 2.	No. 3.
Water	51.36	47.55	50.46
Protein	30.13	33.22	31.06
Fat	11.80	12.58	11.76
Ash	3.97	4.65	4.74
Sodium chloride	(1.19)	(0.86)	(1.20)
Lactic acid	2.79	1.89	1.89

These results show a high water content in all three cheese, which is characteristic of skim milk cheese in general. We note that all the cheese contained about 50 per cent water; the fat contents of the cheese were about twelve per cent, the protein 30 to 33 per cent, and the ash about four per cent.

The water-soluble nitrogen in the cheese was also determined, with results given below:—

TABLE V.—*Soluble nitrogen in skim milk cheese.*

No.	PER CENT OF NITROGEN IN CHEESE EXPRESSED IN FORM OF—				
	Soluble.	Albumen.	Peptones.	Albumoses.	End-products.
1	36.31	1.04	16.91	6.02	12.34
2	21.99	1.14	6 21	1.91	12.91
3	21.73	0.81	1.21	2.21	17.51

The results given in the above table show that cheese No. 1, which was only one week older than cheese No. 2, contained nearly twice as much soluble nitrogen, while cheese Nos. 2 and 3 had practically equivalent amounts of soluble nitrogen. It is reasonable to believe that the high per cent of water-soluble nitrogen in cheese No. 1 is largely due to the poor quality of the milk used. The high albumose and peptone contents indicate a rapid proteolytic action in this cheese. Cheese No. 3 contained more end-products and had a lower peptone content than was found in either one of the other two cheeses.

C. THE EFFECT OF SOIL INOCULATION ON THE DISTRIBUTION OF THE FERTILIZER INGREDIENTS IN SOY BEANS.

The soy bean used in this investigation is known as the Wisconsin Black. The beans of this particular variety are small, black, and high in oil and protein. During the season of 1905, when the work here reported was done, the soy beans were sown on low, rich land, a part of which was inoculated. The roots of the plants which grew on the inoculated land were profusely covered with nodules of varying sizes, while the roots removed from the untreated soil were practically without any nodules.

Average samples were taken from the treated and untreated plots. The roots with nodules were removed from the plant at the division line and analyzed separately. In one lot the capsules, beans, stems, and leaves were analyzed separately and in another lot the whole plant minus the roots was analyzed. The nitrogen and ash contents of the nodules were also determined.

With the exception of the nodules and capsules the analysis of the different parts of the plant was limited to determinations of moisture, nitrogen, ash, phosphoric acid, and potash. Fat or ether extract was included in the analysis of the beans. The results have been calculated both as to per cent and yield in pounds per acre on a water-free basis.

The results of the analyses made showed the percentage composition of the samples of the different parts of the soy beans grown on treated and untreated soils to be as follows:—

TABLE VI.—*Composition of soy beans grown on treated and untreated soils, calculated on water-free basis, in per cent.*

	Protein.	Nitrogen.	Ash.	Phosphoric acid (P_2O_5)	Potash (K_2O)
Inoculated.					
Nodules	25.69	4.11	4.88	....	....
Roots................	14.75	2.36	14.94	0.78	2.36
Stems and leaves ...	9.81	1.57	14.14	0.99	3.39
Capsules	6.63	1 06	6.88	....	....
Whole plant, minus root................	19.00	3.04	10.73	0.68	2.25
Beans.*........	43.81	7.01	5.67	1.78	1.98
Not inoculated.					
Roots...	4.19	0.67	11.28	0.46	1.15
Stems and leaves....	9.06	1.45	15.98	1.07	3.44
Capsules.............	3.00	0.48	8.11	....	....
Whole pant, minus root	16.69	2.67	12.27	0.74	2.33
Beans†..............	38.75	6.20	6.37	1.87	2.02

* Contained 15.78 per cent of fat.
† Contained 18.68 per cent of fat

The above results suggest that inoculation of the soil is beneficial to the plant in several ways.

1. By increasing the nitrogen content of the plant.
2. By decreasing the per cent of ash constituents.
3. Because the roots contain a higher per cent of fertilizer ingredients than those obtained on untreated soil.
4. Because the beans contain more protein and less oil than those grown on untreated soil.

The figures given in the table have been used in computing the yield of the fertilizer constituents in pounds per acre, and the data thus obtained will be found in the following table. The fertilizer values of the different parts of the plant grown under the conditions stated are also included, the nitrogen being valued at 15 cents per pound, and phosphoric acid and potash, each at four cents per pound.

TABLE VII.—*Yield in price per acre of fertilizer ingredients in soy beans grown on treated and untreated soils.*

	Dry matter.	$ Nitrogen.		Phosphoric acid (P_2O_5).		Potash (K_2O).	
Inoculated.	Lbs.	Lbs.	$	Lbs.	$	Lbs.	$
Root	179.5	4.24	.63	1.40	.06	4.24	.17
Plant, minus root	3,455.0	105.00	15.75	23.50	.94	77.70	3.11
Total	3,634.5	109.24	16.38	24.90	1.00	81.94	3.28
Not inoculated.							
Root	213.0	1.63	.24	.98	.04	2.45	.10
Plant, minus root	3,454.7	92.00	13.80	25.60	1.02	80.50	3.22
Total	3,667.7	93.63	14.04	26.58	1.06	82.95	3.32

In the above table the yields of the soy beans and roots are calculated on a water-free basis, assuming that an acre of land contained 100,000 plants of average weight. On this basis the yields are fairly concordant with those obtained at the Michigan Experiment Station*, where similar experiments were conducted. The value of the phosphoric acid and potash in soy beans grown on the treated and the untreated soils is about the same, the greatest difference in value occurring in the nitrogen of the two plants, amounting to $2.34.

The soy beans were grown on low, rich soil in these experiments, which undoubtedly accounts for approximately the same yield of plants in both cases. Had they been grown on a poor or worn-out soil, a striking difference in the yield would in all probability have been observed. General experience has shown that inoculation is beneficial where the legumes have been grown on soils deficient in fertility. Broadly speaking, inoculation of the soil not only increases the yield of the legumes, but also improves the feeding value of the crops, since the increased per cent. of nitrogen is nearly all in the form of true proteids.

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*Bul. 224.

D. ANALYSES OF SALTY MILK.

Owing to difficulties met with in making cheese from the milk received at one of the cheese factories in the State during the past summer, samples of certain lots of milk were secured by the State Dairy and Food Commission and submitted to us for examination. It was found that the milk produced a retarding influence on rennet coagulation. These particular samples of milk were what is known as salty milk. This kind of milk is frequently met with abroad, and our knowledge concerning it is limited to investigations conducted there. "Stink holes" in cheese have been attributed to milks of this nature. It is as difficult to obtain good butter from salty milk as good cheese, and for this reason such milk should not be accepted at the factory under any condition.

Salty milks, like most abnormal milks, such as those obtained from diseased udders, aged or sick cows, are poor in quality. They are generally low in fat, sugar, protein, lime, and phosphoric acid. They have an alkaline reaction, and a high salt content and are distinctly salty to the taste, hence the name.

Samples representing the first part of a milking and of an entire milking from the particular cow to which the trouble was finally traced, were found to have the following composition:—

TABLE VIII.—*Composition of salty and average factory milk.*

	First pint milking.	Whole milking.	Average Wis. factory milk.
	Per cent.	Per cent.	Per cent.
Water	93.87	90.48	87.30
Total solids	6.13	9.52	12.70
Fat	.80	2.16	3.90
Protein (casein and albumen)	2.00	2.44	3.20
Sugar	2.56	4.20	5.10
Ash	.77	.72	.70
Sodium chlorid	(0.354)	(0.228)	(.24)
Calcium oxid	....	(0.127)	(.18)
Reaction	Alkaline	Alkaline	Amphoteric

The above composition is characteristic of salty milk. All the solids (except ash) are low; especially is this true of the fat and protein contents, which are distinctly abnormal. Toward one-half of the ash content is in the form of sodium chlorid, while the ash of normal milk contains less than 0.25 per cent of sodium chlorid.

E. ANALYSES OF HUMAN MILK.

Nineteen samples of human milk have been examined during the past few years; nearly all of the samples were obtained from wives of professional men and were submitted for analysis, because the infants did not do well and failed to make satisfactory gains in weight; the results of the analyses are given in the following table. Samples Nos. 6 and 7 were of milk fed to a premature child with satisfactory results. Samples No. 15, 18, and 19 were considered abnormally low, and artificial preparations were substituted for the mother's milk in these cases. The infants fed on the milk represented by samples No. 9 and 11 did not increase normally in weight, viz, only about an ounce per week; it was, nevertheless, thought best to continue the use of the mother's milk, and after some time the condition of the infants improved, and satisfactory gains in weight resulted.

TABLE IX.—*Composition of human milk.*

No.	Specific gravity at 15½°C.	Water.	Fat.	Protein.	Sugar.	Ash.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	1.0297	86.86	4.34	1.31	7.26	0.23
2	....	83.15	7.80	1.26	7.57	0.22
3	1.0333	87.37	3.58	1.81	6.93	0.31
4	1.0334	87.92	3.18	2.22	6.44	0.24
5	1.0270	86.39	4.98	1.21	7.18	0.24
6	1.0380	87.78	4.60	1.41	5.82	0.39
7	1.0290	89.12	2.91	1.31	6.38	0.28
8	1.0290	87.25	4.51	1.06	5.76	0.19
9	1.0280	89.62	2.13	1.07	6.98	0.20
10	1.0323	88.80	2.28	1.31	7.33	0.28
11	1.0329	89.59	1.71	1.37	7.05	0.28
12	1.0315	86.30	4.73	1.99	6.71	0.27
13	1.0310	85.25	5.61	1.20	7.77	0.17
14	1.0322	88.02	3.35	1.75	6.70	0.18
15	1.0317	89.43	1.95	0.95	7.37	0.30
16	....	86.60	6.00	1.30	5.73	0.37
17	1.0360	87.28	3.72	2.50	6.25	0.25
18	1.0352	89.54	1.44	1.31	7.46	0.25
19	1.0350	90.34	1.26	1.07	7.14	0.19
Average	....	**87.72**	**3.69**	**1.44**	**6.90**	**0.25**
Average composition of human milk (107 samples, König)	1.0270	**87.4**	**3.8**	**2.3**	**6.2**	**3.1**

The analyses given in the table show that the fat content of the milks varied greatly, viz, from 1.26 to 7.80 per cent, while the protein and sugar contents were somewhat more uniform. The differences in composition are doubtless in many cases due to the fact that a representative sample could not be obtained. We note that the average composition of the nineteen samples of human milk was about normal in solids, fat and ash, but the proteids were low, and the sugar correspondingly high. Only two samples out of the total number analyzed had a composition closely similar to that of the average analysis given in the last line of the table, which represents largely European analyses.

F. ANALYSES OF FACTORY BY-PRODUCTS.

A number of samples of by-products, such as spent hops, cotton-seed meal, shrimp refuse, etc., were analyzed in order to determine their fertilizer value; the results of the analyses are given in the following table:—

TABLE X.—*Fertilizer constituents of factory by-products.*

Composition.	Spent hops.	Shrimp refuse.	Dried filter cake.	Garbage fuel.	Cotton seed meal.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Water	88.08	18.39	2.43	4.69	8.69
Nitrogen	0.58	5.89	0.32	0.70	6.72
Ash	0.84	......	......	46.26	7.01
Phosphoric acid (P_2O_5)	0.28	6.91	3.14	3.09	8.33
Potash (K_2O)	0.03	0.65	0.10	0.58	1.67
Calcium carbonate	......	......	74.10	......	......
Magnesium carbonate	......	......	2.35	......	......
Estimated value per ton*	$1.98	$23.72	$9.48	$5.03	$24.16

*N at 15c, P_2O_5 and K_2O at 4c per pound, and lime at 30c a bushel (75 pounds).

In the process of manufacturing beer, large quantities of *spent hops* accumulate. In some breweries these are given away, free of charge, to any one who cares to haul them. Many farmers living in the vicinity of breweries have availed themselves of this opportunity and have applied the hops on their land. The sample analyzed was furnished by the Pabst Brewing Company, Milwaukee. The results suggest that this material with a similar moisture content as that given will make about as valuable a fertilizer as ordinary barnyard manure.

Early last year a carload of *shrimp refuse* was shipped into the State and a sample was submitted to our Station for analysis. This substance, as will be noted from the analysis given in the table, is exceptionally rich in nitrogen and phosphoric acid, and if large quantities could be had at a moderate expense, the farmers should take advantage of the opportunity of purchasing this material. Owing to its high nitrogen and phosphoric acid content, it is worth over 20 dollars a ton at ordinary prices of valuable fertilizer ingredients.

One of the by-products in the manufacture of sugar from sugar beets is the *filter-press cake,* which at the factories in this country is generally allowed to go to waste. The sample analyzed was forwarded by the Wisconsin Sugar Company, Milwaukee. Where soils are deficient in lime, the dried filter cake may be used advantageously, providing the cost of obtaining it is not too great. Its main value lies in its lime and phosphoric-acid contents.

A sample of so-called *garbage fuel,* made in Milwaukee from garbage which consisted of ashes, glass, paper, coal dust, etc., was forwarded for examination last winter. It was thought that this refuse might be useful as a fuel, but analysis showed that it contained such large quantities of inorganic matter as to make it worthless for this purpose. As the material might prove valuable as a fertilizer, it was examined for fertilizer ingredients. The results obtained show that garbage refuse may be worth about $5.00 a ton as a fertilizer, its most valuable component being phosphoric acid, of which it contains about three per cent.

The sample of *cottonseed meal* was submitted for analysis by A. F. Postel, Manager Chippewa Sugar Company. The price asked for this material in our State is too high to make it an economical fertilizer and its use for this purpose cannot therefore be recommended; it will be noted that it is worth nearly as much as a fertilizer as the price asked for the best grades for feeding purposes, showing that the most profitable method of utilizing this material is to feed it to farm stock, and to save carefully the manure, rather than to use it as a fertilizer directly.

THE CHEMISTRY OF MILK CURDLING.*

J. L. SAMMIS.

Beginning in July, 1906, there was instituted, along with other lines of work, an inquiry into the relative value of certain theories which have been advanced to explain the chemical constitution of milk, and the nature of the chemical changes which it undergoes.

Many of the early scientific workers upon milk problems assumed, or endeavored to prove, the existence in milk or curd of one or more compounds of casein with definite proportions of another milk constituent.

The opinion has been voiced repeatedly that milk curd is a compound of casein in definite proportions with lactic acid or other acid used in curdling the milk. The most recent researches have shown that the proportion of acid to casein in curd is not fixed, but varies with the kind of acid, the concentration, temperature, and physical condition of the curd.†

It has been held by many workers on milk problems, that in milk the casein is in combination with some one of the other milk constituents, as calcium phosphate‡ or calcium oxide.§ In the latter case the formation of curd was regarded as consisting of the neutralization of the calcium oxide by acid and the liberation of free casein, which then appeared as the precipitate.*

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* The experiments reported in this article were conducted by this Station in coöperation with the Dairy Division of the United States Department of Agriculture, and will appear also in the publications of that Division.

† Tech. Bul. 3, p. 136, 153, N. Y. Agr. Expt. Sta. (1906).

‡ Jour. Hyg. 7, p. 216 (1907).

§ Landw. Versuchs—Stat. 35, p. 351 (1888).

The first experiments about to be described were directed to test the correctness of these views concerning milk casein compounds and the formation of milk curd.

If the precipitation of milk curd depends upon the neutralization of calcium oxide, then it should be accomplished with equal ease by the use of chemically equivalent quantities of different acids. The quantity of acid required to neutralize the lime and curdle the milk should be quite independent of temperature changes, as are neutralization reactions generally.

COAGULATION OF MILK BY ACIDS AT FIXED TEMPERATURES.

On determining the quantities of a hydrochloric solution required to curdle 17.6 cubic centimeter portions of mixed milk at 40° F, 60°, and 80°, these were found to differ widely from each other. It was also found that chemically equivalent solutions of this and other acids were required in widely differing proportions to curdle the milk. These facts are shown in the following table and accompanying figure.

TABLE I.—*Volumes of tenth-normal acids required to coagulate 17.6 cubic centimeters of milk.*

KIND OF ACID USED.	TEMPERATURE.		
	40°F.	60°F.	80°F.
	cc.	cc.	cc.
Hydrochloric	10.5	8.45	6.25
Lactic	10.5	9.00	7.00
Sulphuric	11.0	9.25	7.50
Acetic	......	12.0	7.50
Tartaric	11.0	9.25	7.50
Nitric	11.5	9.5	7.5
Phosphoric	19.0	15.5	10.5
Citric	12.5	10.0	9.0

These experiments prove that the curdling of milk does not depend upon the neutralization of a definite quantity of calcium oxide, nor can they be explained by assuming the existence in milk of a compound of casein with calcium phosphate, or any other single milk constituent.

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* Bul. 261, N. Y. Agr. Expt. Sta., Geneva (1905).

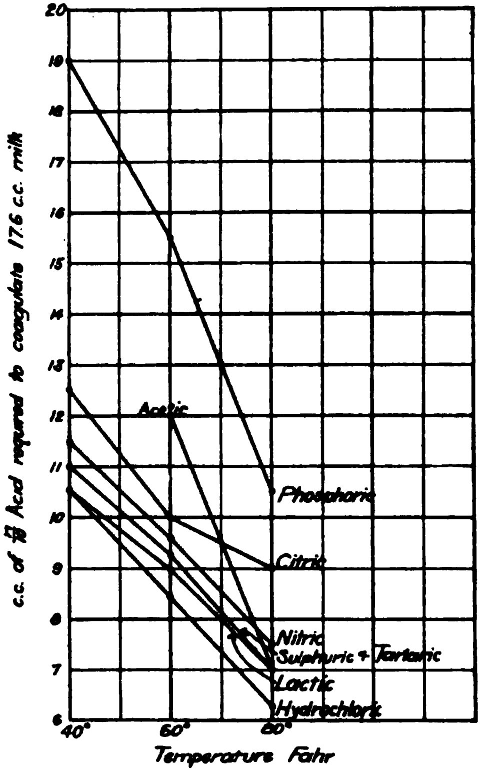

Fig. 27.—Volumes of different acids required to curdle milk at different temperatures. Note the wide variations.

Some of the experiments of Van Slyke and Hart*, referred to above, were performed upon lime water solutions of casein instead of milk. They observed that when a lime water solution of casein is treated with an acid the liquid becomes intensely milky at room temperature before sufficient acid has been added to make the liquid neutral to phenolphthalein. No valid conclusion can be based on this phenomenon respecting the existence of neutral calcium casein in milk, or in the lime water casein solution, because the appearance of the milkiness in the liquid depends not only on the amount of acid added, but also on the temperature of the solution as observed in this laboratory. Thus at 34° F, no milkiness whatever appears in the lime water casein solution until sufficient acid has been added to make the lime water casein solution quite strongly acid to phenolphthalein. This fact can not be explained on the basis of the views of Soeldner or Van Slyke and Hart.

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* Bul. 261, p. 15, N. Y. Agr. Expt. Sta. Geneva (1905).

COAGULATION OF ACIDIFIED MILK BY HEAT.

Having observed that different quantities of a given acid solution are required to curdle milk at different temperatures, it was determined to add different quantities of acid to equal portions of mixed milk and observe the changes of curdling temperature produced by such addition. The determination of curdling temperature at definite acidity proved easier to make than the determination of curdling acidity at fixed temperature, and in the following experiments, curdling temperatures were observed wherever possible. The determination of coagulation temperature is begun by placing about 2 cubic centimeters of the milk in a thin-walled test tube, and inserting a thermometer so as to cover the bulb with the milk. The test tube and contents are inserted in a beaker containing about 200 cubic centimeters of cold water. The water is stirred vigorously while being heated slowly with a bunsen burner, and the temperature is noted at the moment when coagulation occurs in the test tube. If the thin film of milk shaken up on the wall of the tube curdles much sooner than the rest of the milk, it shows that heat is being applied too rapidly.

In tables II to V are given the coagulation temperatures of milk acidified to different degrees by the addition of different acids. The acid used in each case was diluted with water to one-tenth of the volume of the milk, before adding. The percentages of acidity given in the table were determined by titration of 17.6 cubic centimeters of the acidified milk with tenth normal caustic alkali and phenolphthalein. The volume of alkali multiplied by .05 gives the percentage of lactic acid equivalent to the total proportion of acid present.

TABLE II.—*Coagulation temperatures of milk acidulated with hydrochloric acid.*

Acidity of mixture.	Coagulation temperature.
Per cent.	F.
0.27	170-171°
0.31	156-156
0.35	145-146
0.40	100-100
0.45	87
0.47	66-68

TABLE III.—*Coagulation temperatures of milk acidulated with sulphuric acid.*

Acidity of the mixture.	Coagulation temperature.
Per cent.	F.
0.25	180-180°
0.302	164-164
0.36	154-153

TABLE IV.—*Coagulation temperature of milk acidulated with phosphoric acid.*

Acidity of the mixture.	Coagulation temperature.
Per cent.	F.
.27	Not at 212°
.32	178-178
.375	160-160
.43	150-150
.45	144-145
.54	140-138
.60	102-102
.66	98-98
.71	82-84

TABLE V.—*Coagulation temperature of milk acidulated with acetic acid.*

Acidity of the mixture.	Coagulation temperature.
Per cent.	F.
.24	178-179°
.29	163-164
.34	154-154
.38	148-147
.45	102-102
.50	92
.52	62

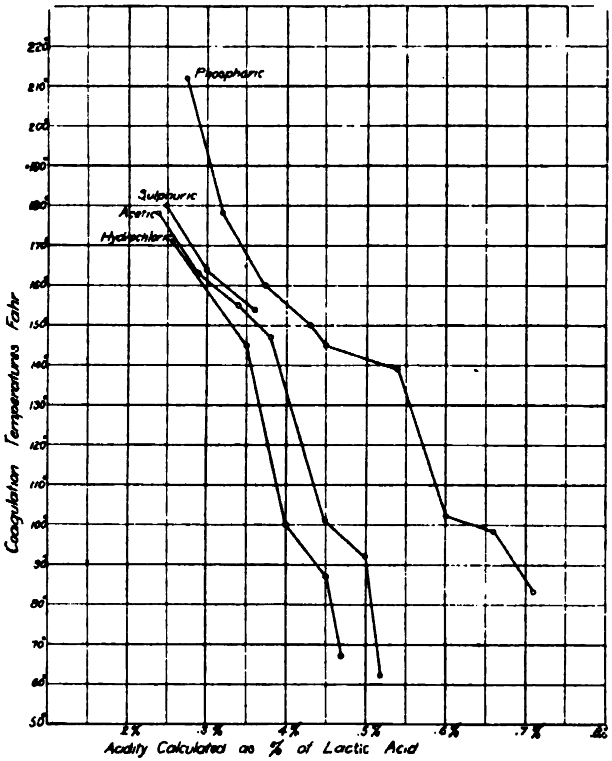


Fig. 28.—Curdling temperatures of milk acidulated with different acids. Note the effect of varying the acids.

RELATION OF NEUTRAL SALTS TO THE CURDLING OF MILK.

The curdling of milk is not dependent upon the addition of any definite quantity of acid, nor indeed upon the addition of any acid whatever. The addition of neutral salts to milk affects the curdling temperature quite as markedly as do acids. The addition of a neutral salt to acidulated milk may entirely remove the possibility of curdling it even at the boiling temperature. On the other hand, the addition of some neutral salts to perfectly sweet milk causes it to curdle at the temperature of a warm summer day.

The following data show typical changes of coagulation temperature produced by adding various substances to sweet or acidulated milk.

The solution of calcium chloride used was 6.23 N. in concentration, and was perfectly neutral to phenolphthalein. This was added in successive small portions to 500 cubic centimeters of mixed herd milk whose acidity had been raised to 0.31 per cent by adding hydrochloric acid. Throughout this paper the acidity of milk is stated as per cent of lactic acid and is calculated by multiplying by .05 the volume of tenth normal alkali required to neutralize 17.6 cubic centimeters of milk to phenolphthalein.

TABLE VI.—*Changes of coagulation temperature produced by calcium chloride.*

Volume of calcium chloride solution added.	Calcium chloride, $CaCl_2$, added to milk.	Coagulation temperature.
cc.	Per cent.	F.
0	0.000	157-155°
1	0.069	143-144
2	0.136	112-114
3	0.204	108-108
4	0.272	106-106
5	0.34	108
6	0.408	110
7	0.476	112
8	0.544	114
10	0 68	144-144
11	0.748	146
13	0.884	152
15	1.020	154
17	1.156	157
20	1.36	160
22	1.496	163
25	1.70	164

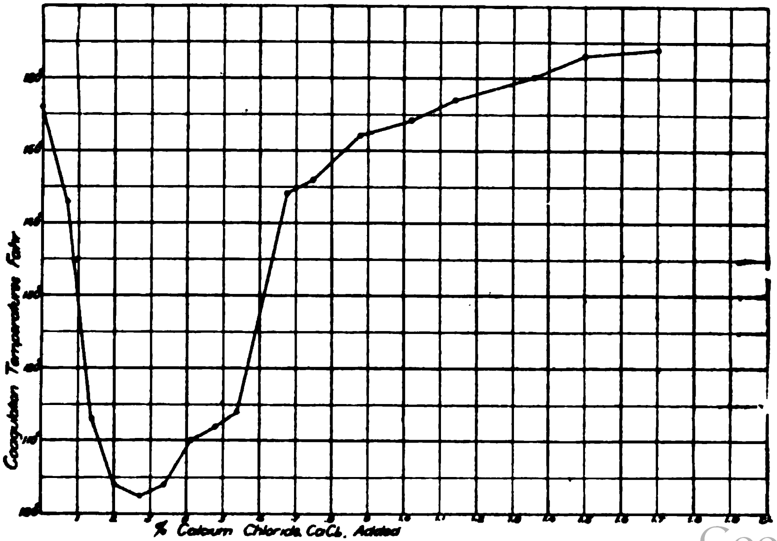
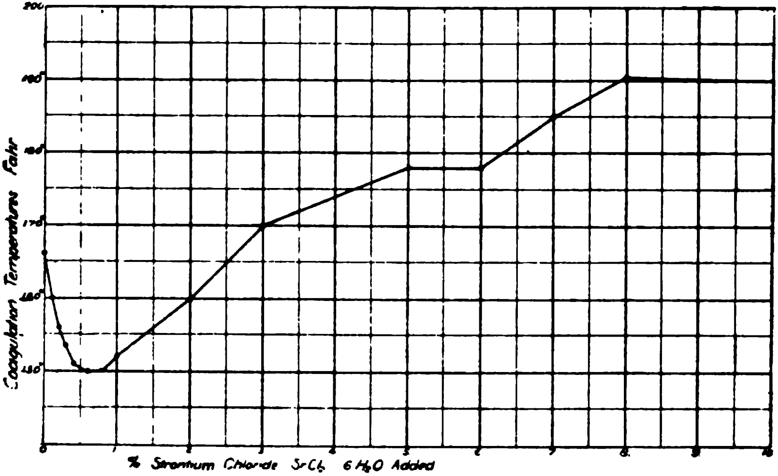


FIG. 20.—Effect of calcium chloride on the coagulation temperature of milk.

Five hundred cubic centimeters of mixed herd milk, acidulated with hydrochloric acid so that the titration showed an acidity equivalent to 0.30 per cent lactic acid, were treated with successive small portions of chemically pure crystals of strontium chloride. The curdling temperature was observed after each addition.

TABLE VII.—*Changes of coagulation temperature produced by strontium chloride.*

Strontium chloride ($SrCl_2\ 6H_2O$), added to milk.	Coagulation temperature.
'er cent.	F
.0	166-166
0.1	160-160
0.2	156-156
0.3	153-154
0.4	151-151
0.6	150-150
0.8	150-150
1.0	152
2.0	160
3.0	170
5.0	178
6.0	178
7.0	185
8.0	191
10.0	190



g. 30.—Effect of strontium chloride on the coagulation temperature of milk.

To 500 cubic centimeters of milk sufficient hydrochloric acid was added to raise the acidity to 0.305 per cent, calculated as lactic acid. Chemically pure crystallized barium chloride was added in successive small portions and the curdling temperature was determined after each addition.

TABLE VIII.—*Changes of coagulation temperature produced by barium chloride.*

Barium chloride ($BaCl_2 \, 2H_2O$), added to milk.	Coagulation temperature.
Per cent.	°F.
None	162-164
0.1	154-155
0.2	148
0.3	146-145-146-146
0.4	123-123
0.5	111-111
0.6	110-111
0.7	111-112
0.8	110
1.	107
2.	161
3.	171
4.	176

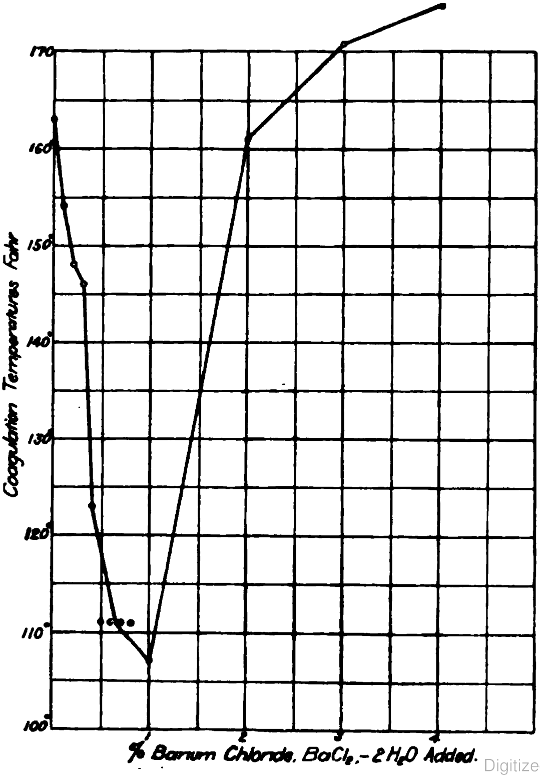


Fig. 31.—Effect of barium chloride on the coagulation temperature of milk.

To 500 cubic centimeters milk of 0.15 per cent acidity was added sufficient hydrochloric acid to raise the acidity to 0.33 per cent, calculated as lactic acid. Merck's chemically pure magnesium sulphate was added in several portions and the curdling temperature was re-determined after each addition.

TABLE IX.—*Changes of coagulation temperature produced by magnesium sulphate.*

Magnesium sulphate ($Mg\ SO_4\ 7\ H_2O$), added to milk.	Coagulation temperature.
Per cent	F.
None	157-159
0.1	158-158
0.3	158-159
0.7	163-164
1.0	168
1.5	177
2.0	182-184

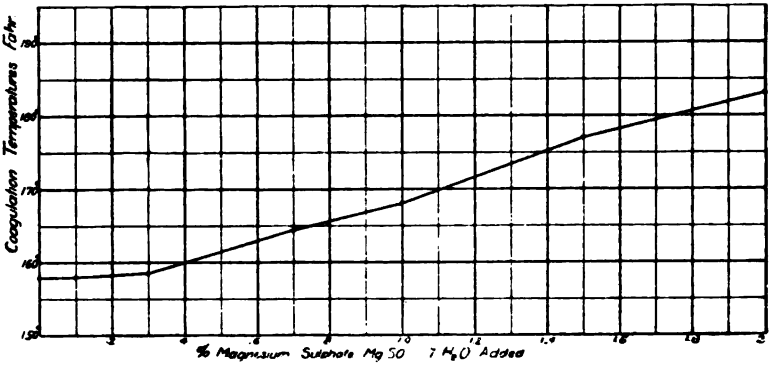


Fig. 32.—Effect of magnesium sulphate on the coagulation temperature of milk.

To 500 cubic centimeters cold, mixed herd milk was added sufficient hydrochloric acid to raise the acidity to 0.35 per cent calculated as lactic acid. Merck's chemically pure crystallized magnesium chloride was added in successive small portions and the curdling temperature was determined after each addition.

TABLE X.—*Changes of coagulation temperature produced by magnesium chloride.*

Magnesium chloride, ($MgCl_2$ $6H_2O$) added to milk.	Coagulation temperature.
Per cent.	F.
None	154-154°
0.1	150
0.2	149
0.3	150
0.4	150
0.5	151
0.8	157
1.	156-159
1.1	163-162
1.2	168
1.3	169

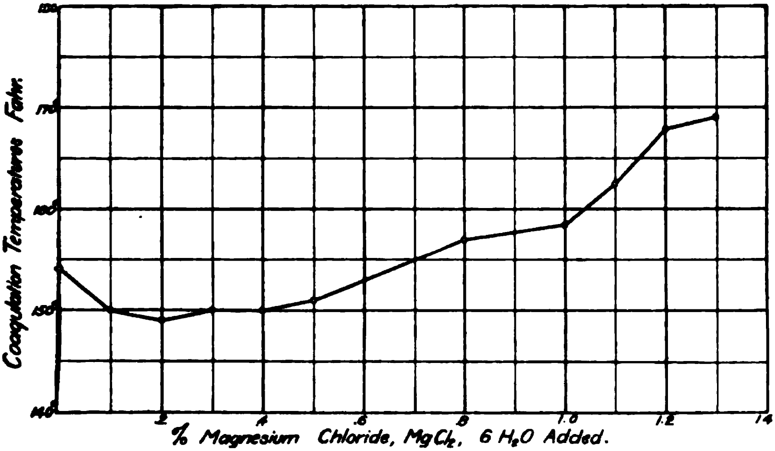


Fig. 33.—Effect of magnesium chloride on the coagulation temperature of milk.

To 500 cubic centimeters of milk, acidulated with hydrochloric acid to 0.35 per cent acidity calculated as lactic acid, was added small portions of chemically pure potassium chloride, from Kahlbaum. The coagulation temperature was observed in 2 cubic centimeters of the milk after each addition.

TABLE XI.—*Changes of coagulation temperature produced by potassium chloride.*

Potassium chloride, (KCl) added to milk.	Coagulation temperature.
Per cent.	F.
None	153-154°
0.1	158
0.2	163
0.3	175
0.4	182

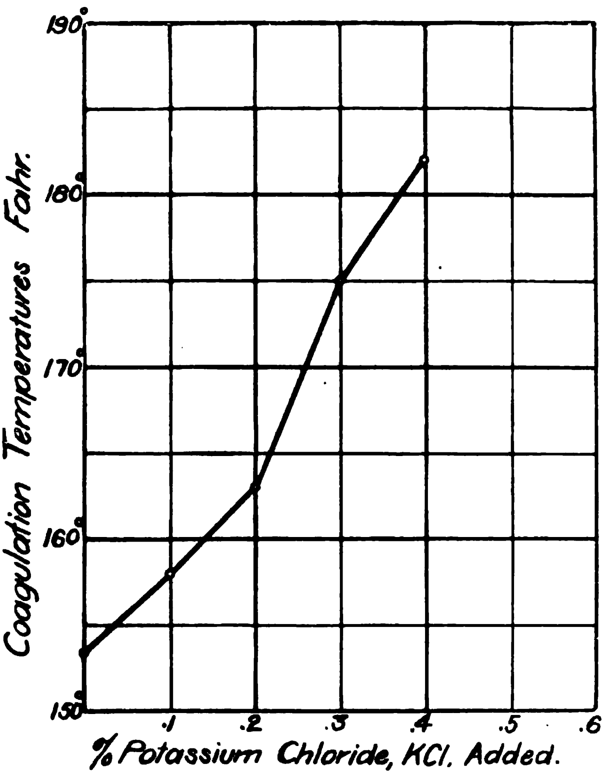


Fig. 34.—Effect of potassium chloride on the coagulation temperature of milk. Note the difference between the effect of this salt and the preceding group of salts.

Different portions of mixed milk were acidulated to different degrees by adding hydrochloric acid. The acidity calculated as per cent of lactic acid is given below. To each portion of acidulated milk there were added several small quantities of Kahlbaum's chemically pure sodium chloride, and the coagulation temperature was determined after each addition.

TABLE XII.—*Changes of coagulation temperature produced by sodium chloride in milk acidulated with hydrochloric acid.*

Acidity calculated as lactic acid.	Sodium chloride, (Na Cl), added.	Coagulation temperature.
Per cent.	Per cent.	F.
0.22	0.0	180-180°
0.22	0.1	184
0.22	0.2	187-188
0.22	0.3	189
0.325	0.0	154-155
0.325	0 1	164
0.325	0.2	169-169
0.325	0.7	192-193
0.37	0.0	148-149
0.37	0.1	153-154
0.37	0.6	178-180
0.37	0.8	188-190
0.39	0.0	138-140
0.39	0.1	145
0.39	0.6	165-168
0.39	1.1	194
0.40	0.0	110-110
0.40	0.6	162
0.40	1.1	178
0.40	1.6	202
0.47	0.1	128
0.47	0.6	158
0.47	1.1	170-168
0.47	1.6	178
0.47	2.1	Not at 210°

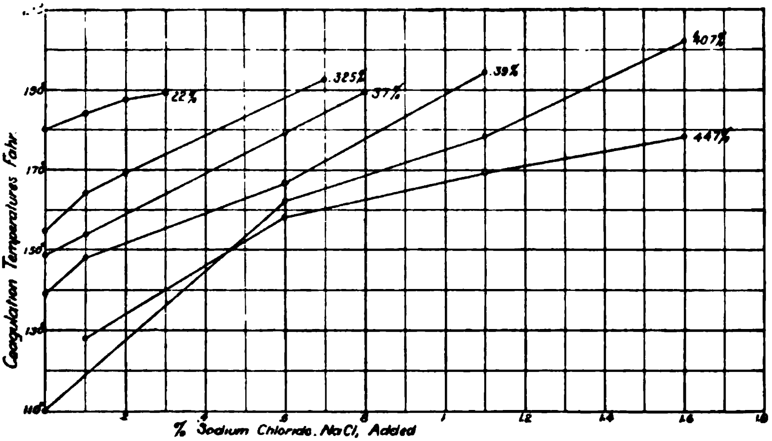


Fig. 35.—Effect of common salt on the coagulation temperature of milk containing various percentages of hydrochloric acid.

Different portions taken from a can of mixed herd milk were acidulated to various degrees as indicated in the table, by adding Merck's chemically pure lactic acid. To each portion of milk were added small quantities of Kahlbaum's chemically pure sodium chloride, and the coagulation temperature was determined after each addition.

TABLE XIII.—*Changes of coagulation temperature produced by sodium chloride in milk acidulated with lactic acid.*

Acidity calculated as lactic acid.	Sodium chloride, (NaCl), added.	Coagulation temperature.
Per cent.	Per cent.	F.
0.24	0.0	181°
0.24	0.1	186-188
0.24	0.2	188-188
0.24	0.3	193-194
0.30	0.0	157-160
0.30	0.1	166
0 30	0.2	174-174
0.30	0.4	192-191
0.36	0.0	150-151
0.36	0.2	158
0.36	0.4	170
0.36	0.9	200-203

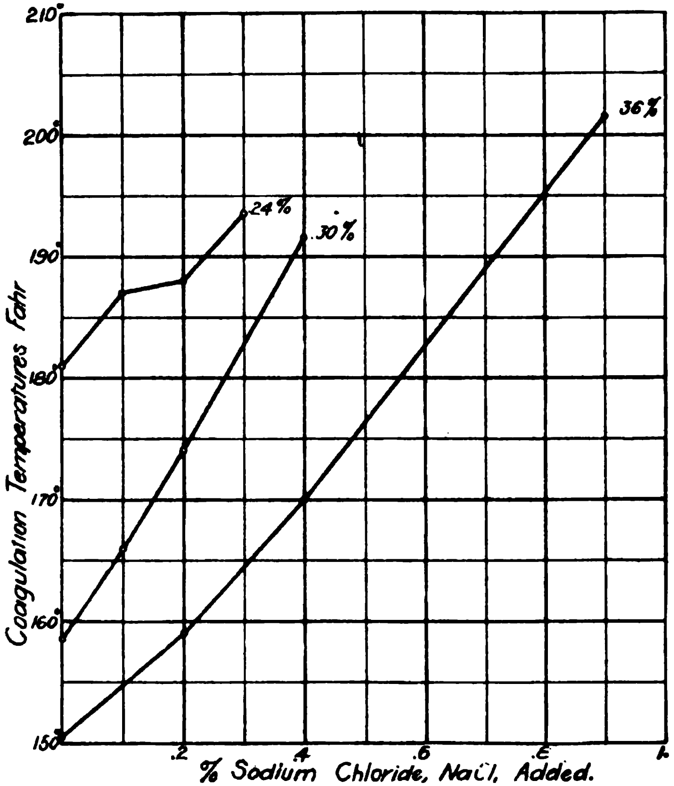


Fig. 36.—Effect of common salt on the coagulation temperature of milk containing various percentages of lactic acid.

RELATION OF WATER AND OF SUGARS TO MILK CURDLING.

Further experiments were conducted to determine whether change in the proportion of water in milk affects its coagulation temperature.

Some cold mixed herd milk was acidulated to .345 per cent by adding to it one-tenth its volume of water, containing pure lactic acid.

Portions of this acidulated milk were diluted with different quantities of distilled water and the coagulation temperature of each portion was determined.

To some portions sodium chloride was also added.

TABLE XIV.—*Changes of coagulation temperature produced by water.*

Sodium chloride, (NaCl) added.	Water added.	Coagulation temperature.
Per cent.	Vol.	F.
0.0	0.0	150-152°
0.0	0.5	156-157
0.0	1.0	161-161
0.0	2.0	168-169
0.0	3.0	186-188
0.4	0.0	172-172
0.4	0.5	172-172
0.4	1.5	186-186
0.4	2.0	190-190

Not only do neutral salts have an important influence on the curdling of fresh and acidulated milk, but they also affect similarly the curdling by heat of milk made alkaline by adding sodium or calcium hydroxides. For example, on adding 100 cubic centimeters of lime water (about N/20 CaO) to 20 cubic centimeters of sweet milk, the mixture was observed to curdle at 181° F. and the further addition of small portions of neutral calcium chloride, up to 4 per cent, gradually lowered the curdling point to room temperature. If a smaller proportion of lime water be used, or if sodium hydroxide be added to milk till strongly alkaline, the subsequent addition of calcium chloride produces coagulation at temperatures varying precisely as observed with milk showing acid reaction. The chemical theory of solution serves to correlate all of these facts.

Cane sugar and milk sugar added to milk depress its coagulation temperature, but to a less degree than any of the salts or acids used. The addition of twenty per cent of the purest cane sugar lowered the coagulation temperature of a sample of milk from 160-160° F. to 155-155° F. The addition of ten per cent of Merck's milk sugar to milk coagulating at 145°, lowered the curdling temperature to 140° F., and twenty per cent of milk sugar lowered it to 135° F. The experiments described above show that variations in the proportion of neutral salts, sugars, acids and of water affect the ease of coagulation of milk. Those who support the view that casein in milk is in chemical combination with one other milk constitutent exclusively, as calcium phosphate, or calcium oxide, should be able to explain these phenomena on the basis of such theory. The application of Arrhenius' theory of electrolytic dissociation to the discussion of these facts is left for any one to undertake who may care to do so.

The conclusion of the writer is, that casein in milk is under the chemical influence of every other milk constituent and that it may truly be said to be chemically combined with every constituent by attractions of greater or less intensity.

Some experiments were made to determine how soon the curdling temperature of milk reaches its new value after an addition of acid or salt has been made, and how long it continues constant thereafter. The following experiment is a typical one:—

A sample of fresh mixed herd milk was cooled in ice water and acidulated by adding slowly to 500 cubic centimeters milk, 50 cubic centimeters of cold dilute hydrochloric acid, which raised the acidity to .36 per cent calculated as lactic acid. No trace of curd appeared during this addition. The milk was kept ice cold thereafter for fifty-six hours. The coagulation temperature was determined at intervals during this period.

Five minutes after acidulation, the coagulation temperature was observed to be 141° F. After one hour and fifteen minutes, the coagulation temperature was 144° F. In two hours and one-half, it was 145° and remained at this point for five hours. Thirty-two hours and also forty hours after acidulating, the milk curdled at exactly 146° F. During the next sixteen hours the curdling temperature fell at the rate of one degree in six hours, due perhaps to bacterial action.

When milk is stored ice cold for some time before determining its coagulation temperature, it is possible by applying heat very rapidly, as by plunging a test tube of the milk into warm water, to coagulate the milk at a somewhat lower temperature than when it is heated slowly. For example, a sample of ice cold milk, acidulated with hydrochloric acid to .367 per cent calculated as lactic acid, and kept ice cold thereafter, coagulated at 144–145° when heated slowly. But the same when plunged into water at 110, 112, 114, 120, 122, 125°, or any higher temperature, curdled instantly. Plunged into water at 100° or below and heated up slowly, it always curdled at 144–145°. After standing six hours ice cold, the flask of milk was warmed to 90° and kept warm for thirty minutes. When a small portion in a test tube was heated slowly, it curdled at 144° as before. But when it was plunged into water at 140°, or any lower temperature, it did not coagulate. After observing this fact repeatedly, the same flask of milk was again cooled to the freezing temperature and left several hours. When heated slowly a portion of it coagulated at exactly 144° as before, but when plunged into water at 110, 114, 117 or 119°, or any higher temperature, it coagulated instantly.

A similar effect is produced by adding some salts to milk. A sample of milk acidified with hydrochloric acid was observed to coagulate at 162-164°. Three-tenths per cent of barium chloride was then added and this mixture on heating slowly, coagulated at 146, 146, 145, 146°. The same milk in test tubes, plunged into water at 118, 121, 125, 129, or 134°, coagulated at once in each case, without further heating. After standing two hours at 88°, portions of the same plunged into water at 118, 125, 124, 128, 131, and 140° did not curdle at these temperatures but curdled at 146° when heated either slowly or rapidly to this temperature. Similar phenomena were observed frequently in different solutions of salts, etc. in milk. The results recorded elsewhere in this paper are not vitiated by ignorance or neglect of these facts.

Such phenomena show that those milk constituents which later enter the curd are while in solution in equilibrium with the other milk constituents, as acid, salts, water, etc., and that the state of equilibrium, as in all reversible chemical reactions, is affected by changes of temperature.

If casein, as often stated, is not completely dissolved in milk, but only semi-dissolved, it nevertheless is not removed from the influence of the chemical attractions exerted by substances in solution.

The interpretation of experimental results from the standpoint of physical chemistry has been of great value throughout this investigation.

The significance of the facts detailed above is to prove that all of the constituents of milk, and not acids alone, take part in the chemical reaction known as curdling.

The whole milk serum is thus regarded as a chemical compound.

This interpretation is in accordance with the "chemical theory of solution", and by it all of the known facts respecting milk curdling can be correlated in a simple manner. Applied to other solutions, it has yielded valuable results and has been brought into notice, during late years, especially by the researches, lectures, and writings of Kahlenberg.*

Aside from the significance of the data herein presented for the physical chemist, some of the facts are of interest to dairymen and students of milk problems generally.

The elevation of curdling temperature produced by adding one per cent, or less, of salt to over-ripe milk may find useful application in pasteurization or separation of cream or other operation where occasionally over-ripe milk must be heated.

Summary.

1. The coagulation of milk by different acids at fixed temperature requires quantities of the acids which are not chemically equivalent to each other.

2. The quantity of any acid required to coagulate a given

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* Chem. Zeit. 29, p. 8 (1905).

sample of milk is less at high temperature than at low temperature.

3. Variations in the proportions of neutral salts, or water, or sugar, as well as acids, present in milk produce variations in the coagulation temperature of the milk. In alkaline milk, neutral salts affect the curdling temperature.

4. The reaction of lime-water casein solution with acid, producing a milky white appearance, is shown to be strongly dependent on temperature.

5. The theories of Hammarsten, Soeldner, Van Slyke, and Hart, and others to the effect that milk as well as lime water casein solutions contain a compound of casein with one other milk constituent, as calcium phosphate or oxide, in definite proportions cannot be reconciled with these facts.

6. The reaction between milk constituents, acids, etc., in solution is reversible and the state of equilibrium among the dissolved substances is affected by changes of temperatures.

7. It is easy to correlate all the known facts respecting the curdling of milk, if one accepts the view that chemical attractions hold all of the constituents of milk serum in union with each other.

8. Expressed in terms of this theory, milk curdles whenever the chemical attractions of curd constituents for each other and of the whey constituents for each other become relatively stronger than those which bind curd constituents and whey constituents together.

I am glad to acknowledge my obligation to my colleagues, Dr. S. M. Babcock and Prof. E. B. Hart, with whom the phenomena recorded and the interpretation thereof, have been freely discussed, and to Mr. L. D. Bushnell and Mr. J. W. Moore, experts of the Dairy Division of the United States Department of Agriculture, who have aided me in observing some of the coagulation temperatures recorded herein.

THE COAGULATION OF FRESH AND ALKALINE MILKS.*

J. L. SAMMIS.

In a preceding article† it was shown that the curdling of milk by heat does not depend upon the acidity of the milk alone, but also upon the content of neutral salts, sugar, etc., in the milk, and that some salts lower and other salts elevate the temperature at which a given sample of milk can be coagulated. It was shown also that the quantity of any acid required to curdle milk varies markedly with the temperature, and that the quantities of different acids required to coagulate milk at the same temperature are not chemically equivalent to each other.

The theory that in milk there exists a definite compound of casein with calcium oxide or calcium phosphate, or any other single milk constituent, was shown to be untenable.

It was concluded that the theory that coagulation depends on the removal of calcium oxide from a definite compound with casein naturally present in milk, can no longer be maintained.

In this paper will be presented typical results showing the effect of neutral salts on the coagulation of sweet, fresh milk and milk containing caustic alkali.

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* The experiments reported in this article were conducted by this Station in coöperation with the Dairy Division of the United States Department of Agriculture, and will appear also in the publications of that Division.

† P. 171, this Report.

THE COAGULATION OF FRESH, SWEET MILK.

To 100 cc. portions of fresh, sweet mixed herd milk were added different quantities of Kahlbaum's chemically pure crystallized magnesium chloride, and the coagulation temperature was observed after each addition.

TABLE I.—*The effect of magnesium chloride on the coagulation temperature of sweet milk.*

Magnesium chloride Mg Cl2 $6H_2O$, added to 100 cc. sweet milk.	Coagulation temperature.
Grams.	F.
0.1	Not at 212°
0.2	188–190
0.3	176–177
0.4	172
0.6	172–172
1.1	176
2.1	187
3.1	190
5.1	198
7.1	200
12.1	202
17.1	204
27.1	Not at 212°
37.1	Not at 212°
47.1	Not at 212°

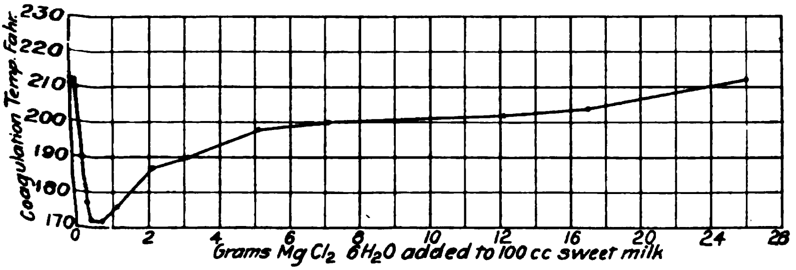

Fig. 37.—Coagulation temperatures of sweet milk containing varying proportions of pure magnesium chloride.

To 100 cc. portions of fresh, sweet mixed herd milk were added different quantities of chemically pure crystallized barium chloride and the coagulation temperature was determined after each addition.

TABLE II.—*The effect of barium chloride on the coagulation temperature of sweet milk.*

Barium chloride, $BaCl_2$ $2H_2O$, added to 100 cc. sweet milk	Coagulation temperature.
Grams.	F.
0.1	Not at 212°
0.2	194-196
0.3	172-173
0.4	163
0.5	154
0.6	148
0.7	142
0.9	133
1.1	131
1.3	132
1.5	137
2.0	145
3.0	158
3.5	156
4.0	159
5.0	166
6.0	172
8.0	177
10.0	178
15.0	178
20.0	178
25.0	177
30.0	164

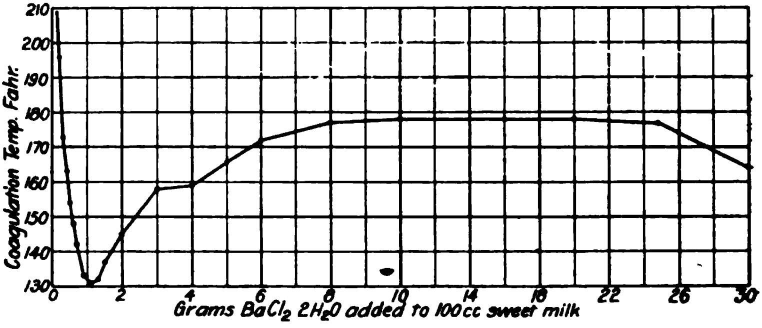

Fig. 38.—Coagulation temperatures of sweet milk containing varying proportions of pure barium chloride.

To 100 cc. portions of fresh, sweet mixed herd milk were added different quantities of Kahlbaum's chemically pure sodium chloride. The coagulation temperature was determined after each addition.

TABLE III.—*Effect of sodium chloride on the coagulation temperature of fresh milk.*

Sodium chloride, NaCl, added to 100 c. c. sweet milk.	Coagulation temperature.
Grams.	F.
5.0	Not at 212°
10.0	Not at 212°
12.0	Not at 212°
13.0	198-197
16.0	194-194
18.0	145-146
20.0	126-128
22.0	124-124
24.0	109-110
26.0	102

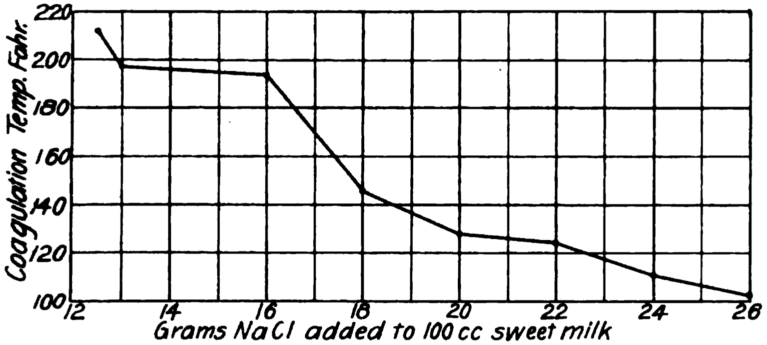

Fig. 39.—Coagulation temperatures of sweet milk containing varying proportions of pure sodium chloride.

To 100 cc. portions of fresh, sweet mixed herd milk were added different quantities of Kahlbaum's chemically pure cobalt chloride. The coagulation temperature was re-determined after each addition.

TABLE IV.—*Effect of cobalt chloride on the coagulation temperature of sweet milk.*

Cobalt chloride, $CoCl_2$ $6H_2O$, added to 100 cc. sweet milk.	Coagulation temperature.
Grams.	F.
0.1	Not at 212°
0.3	163
0.5	117
0.6	110
0.7	106
0.8	105
1.0	103
1.2	103
1.7	98
2.2	113
2.7	118
3.7	130
4.7	138
5.7	140
10.7	149
18.2	160

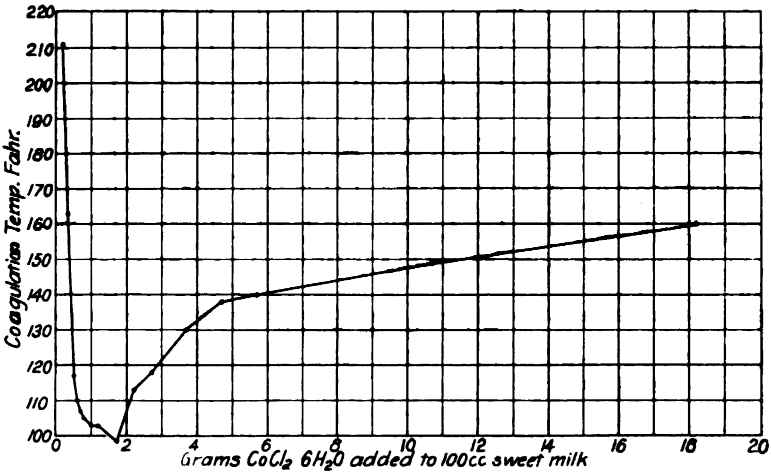

Fig. 40.—Coagulation temperatures of sweet milk containing varying proportions of pure cobalt chloride.

Comparison of the data given above respecting the curdling of fresh, sweet milk with those given in the earlier paper for acidulated milk, and in the following tables for alkaline milk, shows that the three cases are much alike.

COAGULATION OF DILUTED MILK.

The effect of diluting milk strongly with pure water was next studied. A neutral solution of chemically pure calcium chloride of 6.23 normal concentration was used throughout these experiments. Different volumes of this solution were added to 100 cc. portions taken from a large can of fresh, mixed herd milk. A mixture of one volume of the same milk and five volumes of distilled water was prepared, and calcium chloride solution was added to 100 cc. portions of this diluted milk. The proportions used and the coagulation temperatures observed are given in Table V.

TABLE V.—*Effect of calcium chloride on the coagulation temperature of sweet milk and of milk diluted with water.*

Calcium chloride solution added to 100 cc. milk or diluted milk.	COAGULATION TEMPERATURE.	
	Fresh milk.	Diluted milk.
c. c.	F.	F.
0.1	Not at 212°	
0.2	178–180	147°
0.45	147–148	
0.5		130–131
0.95	112–116	
1.0		140–140
1.75		154–154
1.95	116	
2.95	126–128	
3.75		167
3.95	142–142	
5.95	146–148	
8.75		170
10.95	156	
18.75		166
20.95	150	
30.95	154	

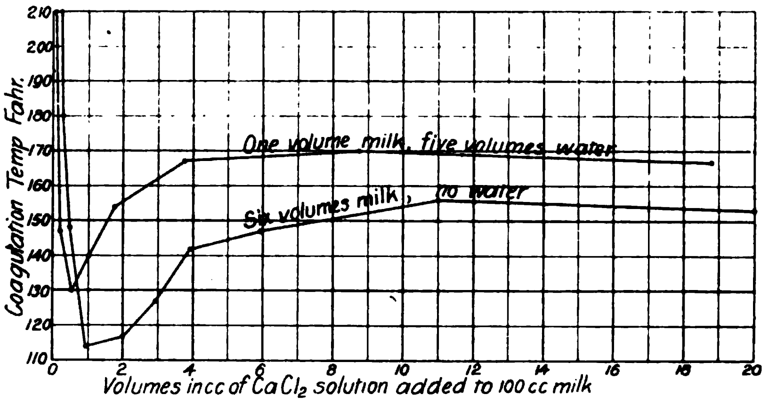

FIG. 41.—Coagulation temperatures observed after adding varying proportions of calcium chloride to sweet milk and to milk diluted with five volumes of water. Note the effect of the large proportion of water in raising somewhat the coagulation temperature, and in changing only slightly the general form of the concentration temperature curve. Compare with following figures where lime water and baryta water are used to dilute milk instead of pure water.

From these results and other similar data given in the preceding paper, it is clear that the dilution of milk with large or small volumes of pure water produces only a slight elevation of curdling temperature.

COAGULATION OF ALKALINE MILK.

In the experiments about to be described, samples of fresh, mixed herd milk were treated with different volumes of caustic soda, lime, or baryta solutions. Each solution so obtained was tested with small successive portions of a neutral salt, and the coagulation temperature was determined after each addition. The salts used were such as give no precipitate in water solution with the caustic alkalies at the concentrations employed.

In Table VI are given the volumes of $\frac{N}{20}$ lime water added to one volume of milk and the curdling temperature of the mixtures in each case.

TABLE VI.—*Coagulating temperatures of lime water and milk mixtures.*

Lime water added to one volume of milk.	Coagulation temperature.
Volumes.	F.
1	Not at 212°
2	Not at 212
3	190
4	187-187
9	184 185
19	174-175
39	161-164

The addition of varying proportions of baryta water, $\frac{N}{5}$ $Ba(OH)_2$, to milk affects the curdling temperature in a manner similar to lime water.

TABLE VII.—*Coagulation temperatures of milk and baryta water mixtures.*

Baryta water added to one volume of milk.	Coagulation temperature.
Volumes.	F.
0.15	Not at 212°
0.30	Not at 212
0.35	210
0.40	205
0.5	194
1.6	182
2.3	176
10.0	167
20.0	156
41.0	142

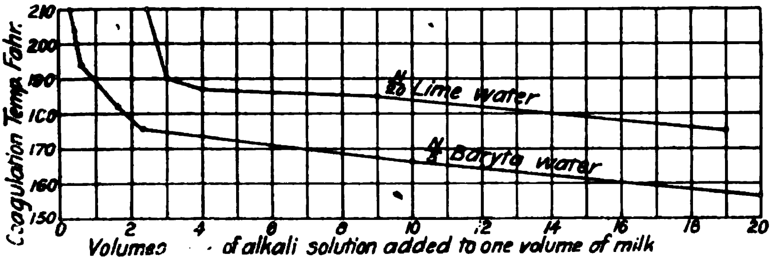

Fig. 42.—Coagulation temperatures of mixtures of milk with varying proportions of lime water and baryta water.

A mixture of 5 volumes milk and 3 volumes lime water was made, which was faintly alkaline to phenolphthalein. To 100 cc. portions of this mixture, different volumes of calcium chloride solution were added. The curdling temperatures are given in Table VIII, column 3.

A mixture of 1 volume milk to 1 volume lime water was found to be intensely alkaline to phenolphthalein. The curdling temperatures observed on adding different volumes of calcium chloride solution to 100 cc. portions of this mixutre are given in Table VIII, column 4.

A mixture of 1 volume milk and 10 volumes lime water was prepared, and to 100 cc. portions were added different volumes of calcium chloride solution. The coagulation temperatures are given in Table VIII, column 5.

All of these determinations were made on the same can of mixed herd milk, in a single day, so that they are all strictly comparable.

TABLE VIII.—*Effect of calcium chloride on the coagulation temperatures of mixtures of milk and lime water.*

Volume of calcium chloride solution added to 100 cc. mixture.	Coagulation temperatures of mixtures of one volume of milk with *n* volumes of lime water.			
	n=0.0	*n*=0.6	*n*=1.0	*n*=10.0
cc.	F.	F.	F.	F.
0.0	Not at 212°	Not at 212°	Not at 212°	178-179°
0.25	178-180	161-162	155	....
0.40	147-148	117	....	128-129
0.50	....	112 115	....	109-110
0.75	....	102-102	142-144	....
0.9	115	102	....	92-92
1.25	....	105	128-130	85-86
2.0	116	110	130	80
2.6	....	108	....	76
3.0	127	....	125	....
4.0	142-142	115	118	66
6.0	146-148	116	121	60
10.0	156	123	115	....
14.0	156	....	....	55
20.0	150	126	120	....
30.0	154	126	....	....

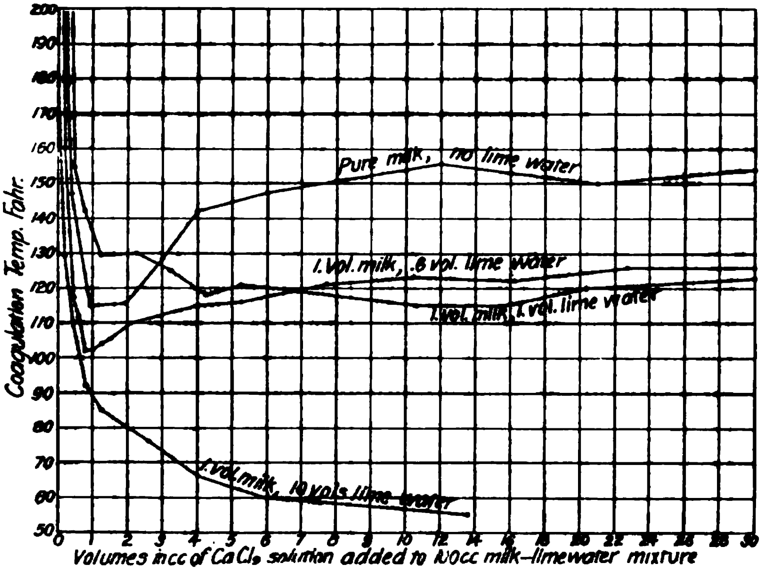

Fig. 43.—Coagulation temperatures observed after adding calcium chloride to various mixtures of milk and lime water. Note the resemblance of the curdling temperature changes observed in alkaline milk, shown in this figure, to those observed in acid milk.

The coagulation of milk made alkaline with sodium hydroxide instead of baryta or lime water is affected by the addition of calcium chloride solution, as shown in Table IX. Portions of a can of mixed herd milk were treated with different volumes of $\frac{N}{10}$ sodium hydroxide solution, and to 100 cc. portions of each mixture were added different volumes of the same calcium chloride solution used in the preceding experiments. The alkaline mixtures were kept in stoppered flasks during the progress of the work.

TABLE IX.—*Effect of calcium chloride on the coagulation temperature of milk made alkaline with sodium hydroxide.*

Calcium chloride solution added to 100 cc. alkaline milk.	Coagulation temperatures of mixtures of one volume of milk with *n* volume of $\frac{N}{10}$ sodium hydroxide solutions.				
	n = .0	*n* = .22	*n* = .30	*n* = .42	*n* = 1.0
c. c.	F.	F.	F.	F.	F.
0.0	Not at 212°	Not at 212°	Not at 212°	Not at 212°	Not at 212°
0.1	Not at 212	Not at 212	Not at 212	Not at 212	Not at 212
0.2	178-180	Not at 212	Not at 212	Not at 212	Not at 212
0.45	147-148		Not at 212	194-195	Not at 212
0.50					Not at 212
0.70		186-188	Not at 212	170-174	198
0.8					155-154
0.9	114				114-114
1.0					97-98
1.1					86-85
1.2				155	82-81
1.3					76-76
1.4					73-73
1.5					71-71
1.7		122-122	130-131		
1.95	116				
2.2		117		141	
2.95	126-128		123		
3.2		115		144	
3.95	142 142	115		144	
4.2		121			
5.2				131	
5.95	146-148		124		
6.2		124			
7.25				121	
11.00	156	130	123	116	
20.0	154	125	123	118	

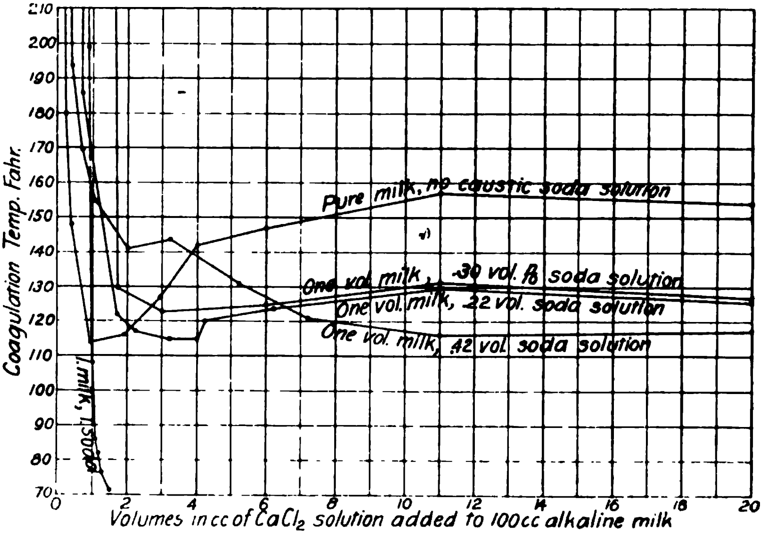

Fig. 44.—Coagulation temperatures observed after adding various proportions of calcium chloride to mixtures of milk and sodium hydroxide solution. Note the general resemblance of the curdling phenomenon observed in alkaline milk, shown in the figure, to those observed in acid milk, shown on page 177 of this report.

To compare yet more closely the coagulation of alkaline milk with that of sweet milk and acidulated milk, a can of fresh, mixed herd milk was divided into several portions. Some of these were mixed with hydrochloric acid, others with baryta water, and one portion was kept unmixed. To all of these, chemically pure, crystallized barium chloride was added in successive small portions, and the coagulation temperature was observed after each addition. In Table X are given the results obtained in the acid mixtures, and in Table XI the data respecting the alkaline mixtures.

The acidity of milk is stated, as in the preceding paper, as the percentage of lactic acid equivalent to the acid present in the milk, whether the acid present be hydrochloric or any other.

TABLE X.—*Effect of barium chloride on the coagulation temperature of milk acidulated with hydrochloric acid.*

Barium chloride, $BaCl_2\ 2H_2O$, added to 100 cc. acid milk.	Coagulation temperatures of sweet milk and milk acidulated with hydrochloric acid. Acidity stated as per cent of lactic acid.			
	Acidity .21 per cent.	Acidity raised with hydrochloric acid to		
		.38 per cent.	.42 per cent.	.48 per cent.
Grams.	F.	F.	F.	F.
0.0	Not at 212°	145-145°	135-136°	93-93°
0.1	......	110	......	93-94
0.2	172-172	103-103	122-124	93-94
0.3	......	100	119	95-97
0.4	158	103-104	112	......
0.5	......	......	110	99-100
0.6	......	......	106-105	......
0.7	......	108	107-109	......
0.8	......	......	113-113	......
0.9	113	......	......	......
1.0	......	......	122-124	106-107
1.1	114	......	......	......
1.2	......	......	......	......
1.3	118	126	......	......
1.5	......	......	150-151	......
1.8	158	......	......	......
2.0	......	......	......	153-153
2.3	......	170-171	......	......
2.5	......	......	......	162-162
2.8	177	......	......	......
3.3	......	212	Not at 212°	......
3.5	......	......	......	181
4.8	187	......	......	Not at 212°
9.8	193	......	......	......
10.3	......	Not at 212°	......	......

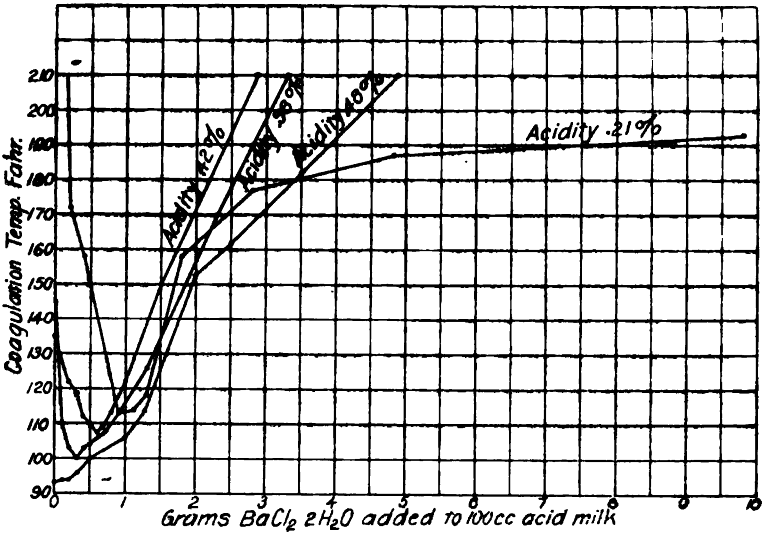

Fig. 45.—Coagulation temperatures observed after adding varying proportions of barium chloride to milk acidulated with different percentages of hydrochloric acid. Compare this figure with Fig. 46, in which the same milk was treated with baryta water instead of hydrochloric acid.

It is interesting to note that the curve showing the curdling of milk of .48 per cent acidity, in Fig. 45, has the same general form as the curves obtained by use of sodium chloride and acidulated milk, shown in a preceding article. It is clear also that the change of curdling temperature produced by adding any substance depends very much on the other substances present.

TABLE XI.—*Effect of barium chloride on the coagulation temperature of milk made alkaline with baryta water.*

Barium chloride, $BaCl_2 2H_2O$, added to 100 c. c. alkaline milk.	Coagulation temperatures of mixtures of one volume of milk with *n* volumes $\frac{N}{5}$ baryta water.			
	n=0.0	*n*=.18	*n*=.33	*n*=1.0
Grams.	F.	F.	F.	F.
0.0	Not at 212°		Not at 212°	
0.1		181°	Not at 212	180°
0.2	172-172	159	170-171	
0.3			128	
0.4	158	141	103	
0.5			86	177
0.6			78	106
0.7			60	104
0.8				88
0.9	113	150		88
1.0				
1.1	114			
1.3	118			
1.4		145		
1.8	158	144		
2.1				76
2.8	177	130		
4.8	187			
7.8		146		
9.8	198			
12.8		130		

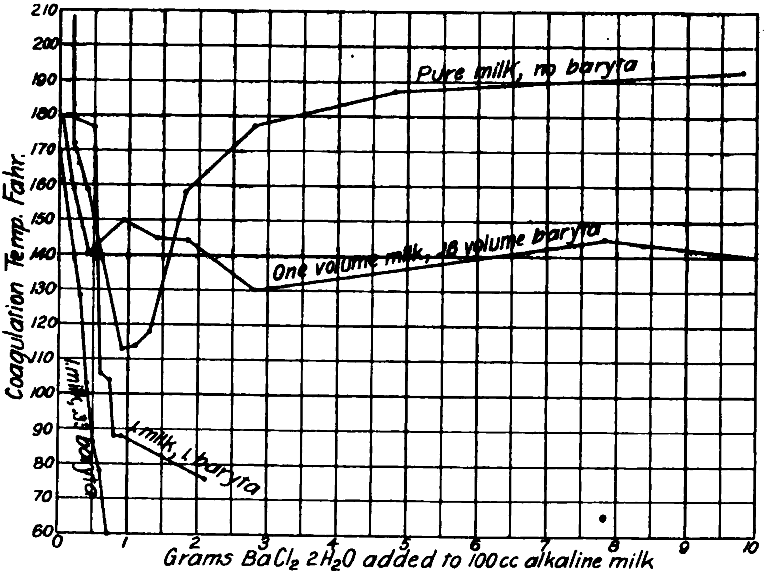

Fig. 46.—Coagulation temperatures observed after adding varying proportions of barium chloride to milk made alkaline with baryta water. Note the similarity between the curves in this figure and in Fig. 45.

COAGULATION OF LIME WATER AND CASEIN SOLUTION.

On dissolving one gram of pure casein, prepared according to Hammarsten's method from fresh milk, in 100 cc. lime water, and applying heat, casein is thrown out of the alkaline solution at once.

In every case, the clear solution becomes intensely milky white shortly before the coagulation temperature is reached. The addition of barium chloride to such solutions lowers the coagulation temperature, as shown in Table XII.

TABLE XII.—*Effect of barium chloride on the coagulation temperatures of casein and lime water solutions.*

Barium chloride, $Ba\ Cl_2 2H_2O$, added to 100 c.c. casein lime water solution.	Coagulation temperatures of casein and lime water solutions containing	
	1 per cent casein.	3 per cent casein.
Grams.	F.	F.
0.0	Not at 212°	Not at 212°
0.1	180	180
0.2	164	......
0.4	152	110
0.5	......	102
0.6	150	98
0.8	......	88
1.0	......	78
1.1	135	......
1.6	139	......
2.1	136	......
3.1	122	......
4.1	115	......
5.1	104	......
6.1	99	......
11.1	74	......

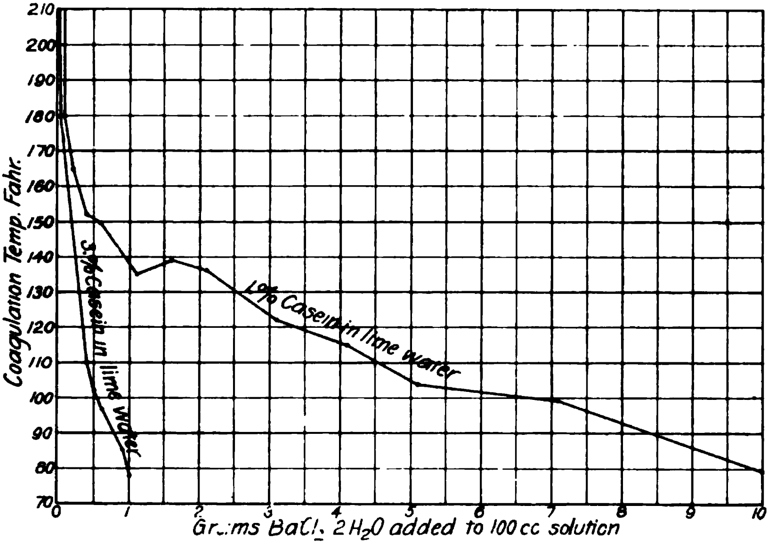

Fig. 47.—Coagulation temperatures observed in lime water solutions of casein after additions of varying proportions of barium chloride. Note that the effect produced by dissolving the salt in this solution is much the same as in milk, shown in the preceding figures.

Analyses of a number of filtrates from precipitates formed in both acid and alkaline mixtures of milk show that the precipitation of nitrogenous bodies varies in completeness with the composition of the milk and the temperature employed. This conforms to the general fact that the composition of a liquid phase strongly influences the composition and proportion of a solid phase separating therefrom.

Reference should be made at this point to the work of Hammarsten* upon the relation of different acids to milk and lime water and casein solutions.

Stohman* in describing the properties of pure casein, says substantially that when equivalent quantities of hydrochloric or acetic acids are added to milk or to casein solutions, very different effects are produced. The quantity of tenth normal acetic acid required to produce a permanent precipitate is one and one-half times as great as the quantity of tenth normal hydrochloric acid required to produce the same effect.

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* Nova Acta Upsal, 1877, p. 37.

† Milch und Molkereiproducte, p. 39.

These facts all confirm the conclusions reached in the preceding paper and render it very certain that milk curdling does not depend upon the neutralization of lime alone, but is a reaction in which all of the constituents of milk take part.

I am under obligations to Messrs. J. W. Moore and L. D. Bushnell, experts of the Dairy Division of the United States Department of Agriculture and to Mr. William White and Mr. C. L. McNally, senior students, for aid in observing some of the duplicate coagulation temperatures given above.

AN AUTOMATIC CHEESE PRESS.*

J. W. MOORE.

In connection with the co-öperative investigation carried on by the Dairy Division, United States Department of Agriculture and this Experiment Station on problems concerning the manufacture of American cheese, it has been found necessary for the success of the experiments to provide means of regulating the pressure applied tò cheese while in the press.

There are several continuous presses on the market. In one of these a large weight is attached to a long lever which descends as the cheese shrinks. The pressure varies with the position of the lever arm, being greatest when the arm is horizontal.

In another form of press, the weight of the cheese and part of the press are used to move a lever in a similar way. In this arrangement the pressure varies with the weight of the cheese in the press and can not be regulated at will.

The automatic cheese press herein described is a modification of the ordinary press, and is constructed to maintain automatically a constant pressure for any desired length of time.

The accompanying illustration shows a half section view of the new press in action.

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* The experiments reported in this article were conducted by this Station in co-operation with the Dairy Division of the United States Department of Agriculture, and will appear also in the publications of that Division. The author is stationed at Madison by the Dairy Division as expert cheese-maker.

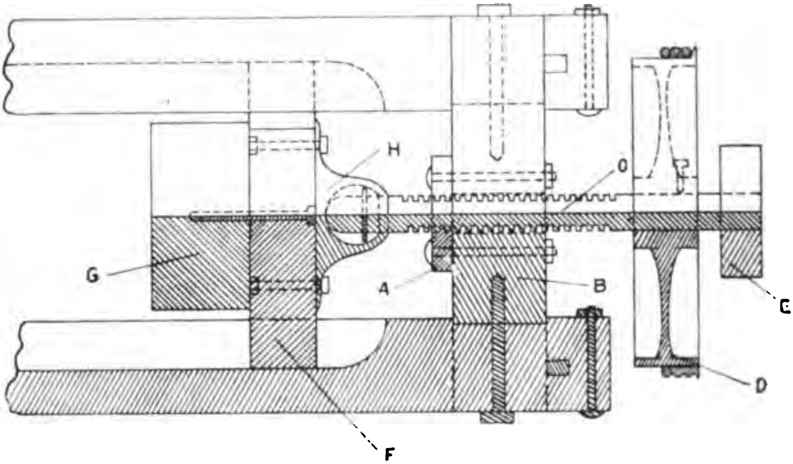

Fig. 48.—The self-acting parts of an automatic cheese press: A, threaded nut; B, permanent cross-piece in press; C, threaded shaft of screw; D, common belt pulley; E, journal; F, wooden head block guide; G, common cheese press head block; H, swivel.

A threaded nut (A) is set into the cross piece (B) at the end of the press. A screw (C), taken from an old vertical cheese press, works through the nut and the cross piece. A pulley (D) is attached rigidly to the screw (C) near its outer end.

The journal (E) is set in a plank fastened to the floor; the other end of the screw fits into a swivel (H) which presses against the guide (F).

The head block (G) is attached to the guide (F) by means of a lagscrew. The screw (C) is 1⅝ inches in diameter and has three coils of thread to the inch. Pulley (D) is 13 inches in diameter.

The guide slides forward in the grooves when the pulley is turned.

A rope, wrapped several times around the pulley, passes through a small pulley fixed to a beam overhead. Weights are attached to the rope to produce any desired pressure on the cheese in the press. Instead of calculating the pressure, this was directly determined by measuring the distance between two punch marks on a heavy coil spring before and after applying the pressure. The compression which this spring exerts under various different loads was determined in the testing laboratory by Prof. H. F. Moore of the College of Engineering, University of Wisconsin. The compression-load curve was then plotted. This furnished a ready means of determining the load corresponding to any compression observed in the course of experiment. The load at any time divided by area of the bottom of the cheese hoop in square inches gives the pressure per square inch on the cheese in the press.

The press has been in use for several months. The cheese taken from it daily are uniformly free from mechanical openings, so that candle plugs are usually obtained. As well closed cheese are desired by every cheese maker, the description of this apparatus is given at this time, together with some data respecting cheese made by its use. It will be seen that the principles employed in the new press can be applied with equal effectiveness in a variety of ways.

The results of several months of experimenting indicate that about 48 pounds per square inch on the end of the cheese is sufficient to close any curd, even if very firm, provided that it has been properly handled before pressing.

Previous to dressing the cheese, pressure is applied by means of the hand lever only. (Shown at the left side of Fig. 49.) About thirty minutes later the cheese are dressed. The pressure is then raised with the hand lever to 3,050 pounds when using cheese hoops 9 inches in diameter. The pressure is determined easily from the compression of the spring. When the coil spring showed that the desired pressure had been established, an ordinary spring balance applied at a marked place on the hand lever indicated that a pull of 28 pounds was required to start the lever.

It was found that the presence of the spring in the press slightly interfered with the regular action of the continuous pressure device. Therefore the coil spring may be left out of the press and the spring balance used to determine when the proper pressure has been applied to the cheese by means of the hand lever.

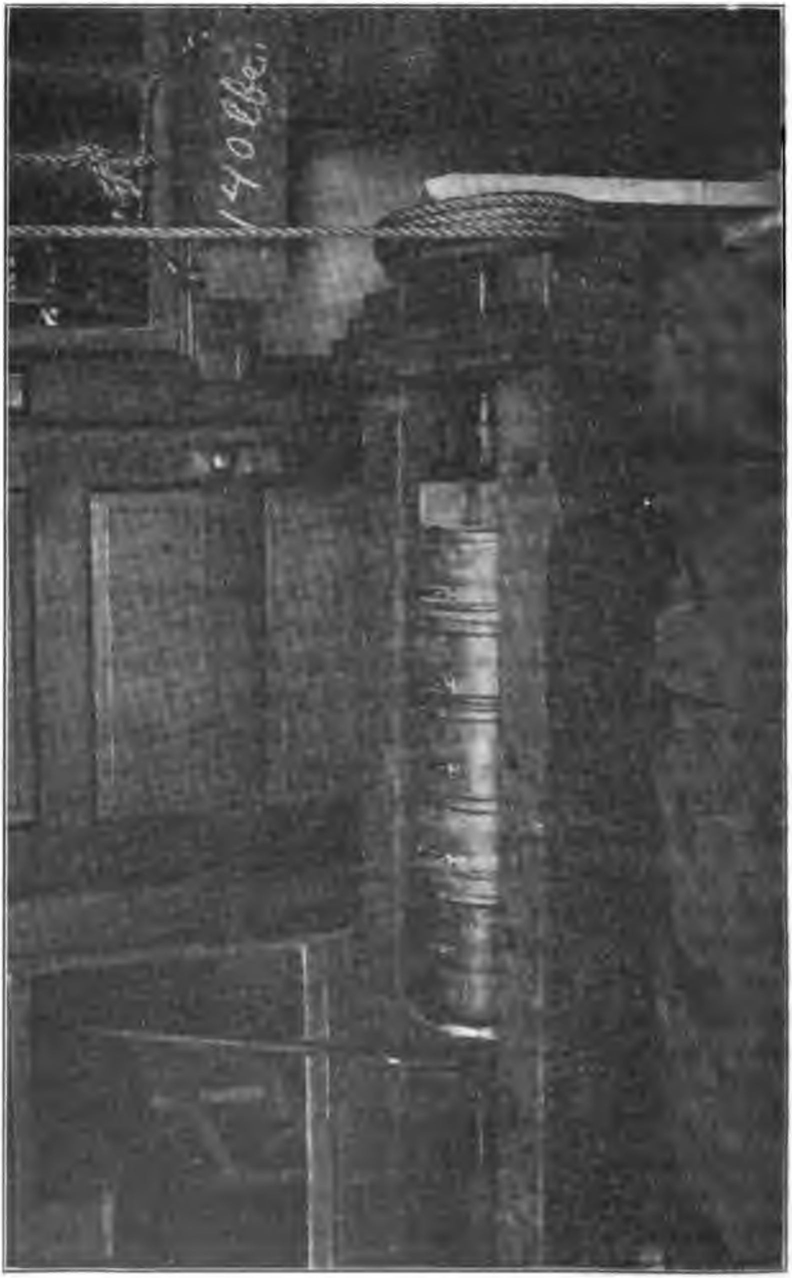

Fig. 49.—Automatic cheese press. The 140 pound weight moves the screw which keeps the pressure constant.

In order to maintain this pressure constant during the night it is only necessary to hang the weight on the rope. As the cheese shrink, the weight descends and the head block moves forward. By using apparatus of the dimensions given above, it was found that the shrinkage of the cheese permits the weight to fall a distance equal to about 1.5 times the length of the column of cheese in the press. On thirty-one successive days on which cheese were made, the pressure applied to the cheese after dressing was forty-eight pounds per square inch. After leaving the constant pressure device in action over night, the pressure was measured again in the morning by means of the spring balance and coil spring, as described above.

The following table shows the length of the column of cheese in the press, the distance which the weight fell during the night, and the pressure per square inch on the cheese in the morning.

TABLE I.—*Observations on the action of the automatic cheese press.*

Date, 1907.	Length of cheese in press.	Fall of the weight during night.	Pressure per square inch in morning.
	In.	In.	Lbs.
July 13	22	....	42.4
July 16	22	36	50.4
July 19	22	36	48.7
July 20	22	30	48
July 23	22	33	48.7
July 24	22	39	45.5
July 25	22	37	45.5
July 26	22	35	48
July 31	22	26	45.5
August 1	22	32	48
August 2	22	39	44.8
August 3	22	32	48
August 6	22	34	48
August 9	22	31	51.8
August 10	22	42	48
August 13	33	48	50.4
August 16	33½	49	51.8
August 17	22	26	50.4
August 20	16½	24	48
August 21	16½	32	48.7
August 22	16½	27	50.4
August 23	16½	30	50.4
August 24	16½	29	50.4
August 27	16½	28	50.4
August 29	16½	23	48.7
August 30	16½	28	50.4
September 3	16½	26	50 4
September 4	16½	23	51.8
September 5	16½	28	50.4
September 6	16½	28	50.4
September 19	16½	25	51.8

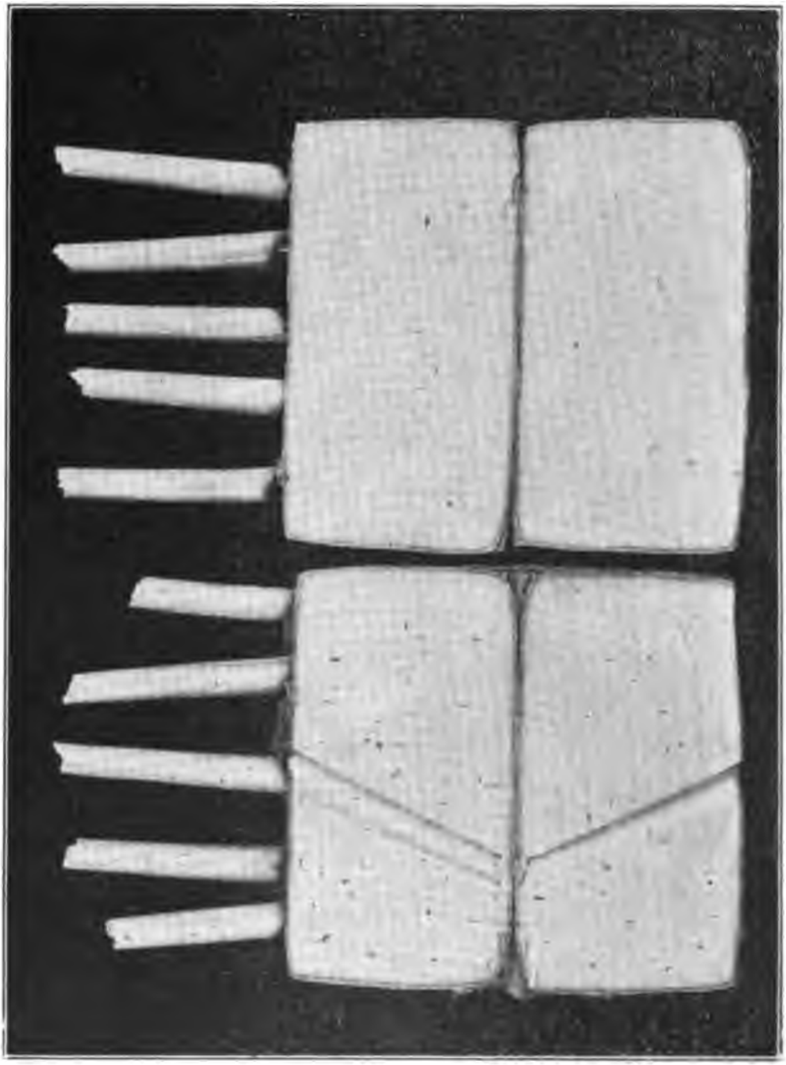

Fig. 50.—The cut surface and plugs from two cheese made in same vat. The open cheese, lower section, was pressed in an ordinary press; the well closed cheese, upper section was pressed in Moore's automatic press. Note the much closer texture of cheese of the latter.

Two cheese made from the same curd are shown in the accompanying figure made from a photograph. The well closed cheese was pressed in the improved press, described above. The other cheese was pressed in an ordinary press according to best factory practice.

The advantages of applying these principles in the ordinary American cheddar cheese factory may be summed up as follows:—

1. By using the proper weight on the rope the cheese can be put under any required pressure.

2. By insuring continuous pressure during the night, the cheese are more perfectly closed than is otherwise possible.

3. When the continuous pressure device is used, there is less loss of fat, because a lower pressure is applied to the warm curd than is required with the ordinary press.

* * * *

I desire to thank Dr. S. M. Babcock, Mr. G. A. Olson, and Dr. J. L. Sammis for valuable suggestions and aid in this work.

BACTERIAL CONTENT OF MACHINE-DRAWN AND HAND-DRAWN MILK.

E. G. HASTINGS AND CONRAD HOFFMANN.

Within the last few years the use of the milking-machine has been rapidly extended. Especially on the large dairy farms producing milk for city consumption has it met with favor, on account of the difficulty of obtaining efficient milkers. Since many such farms are attempting to produce milk having a low germ content, the question as to the bacterial content of machine-drawn milk as compared with that drawn by hand under similar conditions is an important one.

CONTAMINATION OF MILK.

Under ordinary farm conditions the most important source of contamination is the animal. The dust and dirt dislodged by the motions of the milker from the udder and flanks of the animal carry an immense number of organisms into the milk. This contamination is not only of importance quantitatively but also qualitatively, for the bacteria thus gaining entrance into the milk are likely to consist largely of forms able to produce abnormal changes in the milk. This source of contamination is the most difficult one to exclude. Various means are taken to limit it, such as the wiping of the udder and flanks of the animal with a damp cloth just before milking, and the use of milk pails with small openings instead of the open pail. It has been shown by numerous investigators, especially by

Stocking*, that such precautions materially decrease the amount of contamination. With the milking machine this source of contamination would seem to be excluded since there are no exterior openings into which the dirt from the animal may fall.

The contamination coming from the interior of the udder is the same whatever the manner of milking. The utensils employed in hand-milking are easily kept clean, being of such simple construction. The milking machine is somewhat complicated in its construction, because of the difficulty in conveying the milk from the teats to the receiving can. For this purpose several rubber tubes, varying in length from six inches to several feet, are used. These are difficult to clean. They can not readily be washed free from the milk, they can not be dried so as to prevent bacterial growth, nor can they be sterilized without injury to the rubber by passing steam through them. The only way to keep them in a sanitary condition is to rinse them with cold and then with warm water and finally immerse them in an antiseptic solution between the periods of use.

The results obtained by Stocking† and Edwards‡ have indicated that the milking-machine may become a most important factor of contamination unless kept in a sanitary condition. In fact, the work of these investigators resolves itself into a study of the various methods suggested for the treatment of the rubber tubes and other parts of the machine. The work of Stocking has shown that with a clean machine, intelligently used, milk with lower germ content can be produced than by hand-milking under similar barn conditions.

It would seem that with clean utensils the difference in the bacterial content of hand and machine-drawn milks will depend largely on the amount of contamination from the animal. From cows whose flanks are covered with manure the contamination in hand-milking will be great, while with the machine it should be much less. With improved barn conditions the differences should decrease, until under the best conditions it becomes nil.

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*Bul. 42, Storrs Expt. Sta.

†Bul. 92, U. S. Dept. Agr., Bur. of Anim. Indus. Bul. 47, Storrs Expt. Sta.

‡Bul. 159, Ontario Agr. Col. and Expt. Farm.

CONDITIONS OBTAINING IN THE TRIALS.

Barn conditions.—It has been pointed out that the difference in bacterial content of hand and machine-drawn milk will depend largely upon stable conditions. In the University barn no extraordinary means are taken to produce milk with a low germ content. The construction of stable, metal ceiling and walls, cement floors and mangers, makes it easy to keep the stable in good sanitary condition.

The animals are kept clean, *i. e.*, under winter conditions no accumulation of filth is to be noted on the flanks and udders. The udders are not clipped, nor are they wiped with a damp cloth previous to milking. In short the precautions taken to prevent contamination are not greater than can easily be taken on an ordinary farm. The milk pails are sterilized by steam, after being washed. Pails with twelve inch openings are used.

Treatment of the machines.—As previously mentioned, the most difficult parts of the machine to clean are the rubber tubes. Since it is difficult to wash them free from milk without an excessive expenditure of time and labor, and since the inside can not be dried, it is necessary in order to prevent bacterial growth, to immerse them in an antiseptic solution. The solution should be one that has no injurious effect on the rubber, and one that would not be harmful in case a small quantity gained entrance to the milk through imperfect rinsing of the tubes before milking. Brine, a two to three per cent solution of formalin, and lime-water have all been recommended. In our work lime-water has been employed. The strength of lime-water is almost exactly equal to that of a twentieth-normal solution of alkali, a sufficient degree of alkalinity to prevent all growth of molds and bacteria. Care must be taken to use only perfectly fresh unslaked lime and to maintain an excess in the vessel.

The tubes were rinsed with cold water, then with warm and finally placed in the lime water. The remaining parts of the machine were washed in the usual way and well steamed. The time involved in preparing the machines for use and washing them subsequently thereto has averaged about eighteen minutes per machine.

The good results obtained in these trials are largely due to the intelligent and careful handling of the machine in the stable by Mr. W. E. Markey.

Quantitative bacteriological methods.—The methods employed for the quantitative examination of the milk were as follows: A one per cent lactose agar was used. The reaction of the agar was one per cent acid, *i. e.,* containing the equivalent of 10 cubic centimeters of normal acid per liter. The incubation was for forty-eight hours, at 37° C.

Sampling.—The samples examined were all the milk of individual cows, rather than composite samples. This method was followed in order to avoid the contamination during the subsequent weighing and sampling of the milk for chemical examination. The samples were taken from the pail at the end of milking or from the receiving can of the machine. They were taken at night and kept in the refrigerator. The plates were made about sixteen hours after the samples were taken.

RESULTS OBTAINED.

Cleanliness of the machine.—Repeated examinations of the machine with reference to its bacterial content were made. The lime-water in which the rubber tubes were kept was examined quantitatively with results as presented in Table I.

TABLE I.—*Bacterial content of lime-water.*

Date	Feb. 16.	Mch. 1.	Mch. 5.	Mch. 7.	Apr. 2.	Aug. 14.
Bacteria per cubic centimeter	72	25	100	180	125	14

The tests as to the condition of the machine were made by passing sterile water through the teat-cups and rubber tubing into the machine either before or after rinsing with hot water to remove the lime water. Plates were then made from the rinse water. In Table II are given the results obtained.

TABLE II.—*Germ content of water passed through the milking-machine.*

Date.	Dec. 19.	Dec. 19.	Jan. 11.	Jan. 11.	Jan. 15.	Jan. 15.	Mch. 12.	Mch. 12.	Aug. 14.	Aug. 14.	Aug. 15.	Aug. 15.	Aug. 21.
Condition of machine.	Not rinsed.	Rinsed.	Not rinsed.	Rinsed.	Not rinsed.	Rinsed.	Not rinsed.	Rinsed.	Not rinsed.	Not rinsed.	Not rinsed.	Not rinsed.	Not rinsed.
Quantity of water used, pounds.....	....	....	8	8	10	10	7	7	8	8	8	8	60
Bacteria per cubic centimeter of water.............	40	100	30	30	20	190	40	70	510	1900	390	550	570

The results show that the condition of the machine during the winter months was good, but at the time the examinations were made in August it was less satisfactory. The cause of this may be due to the condition of the rubber tubes, which had been in use for nearly a year. With prolonged use the rubber becomes hardened and minute cracks are formed into which the milk may penetrate and from which it is impossible to remove it. Even when placed in the lime-water, the alkaline solution penetrates into these minute cracks slowly. Such conditions have been shown by Bissell to exist in the long rubber tubes used on nursing bottles. It may happen that the tubes are placed in the solution in such a way that the lime water does not completely fill them. Under such conditions bacterial growth can occur.

QUANTITATIVE BACTERIAL CONTENT OF THE MILK.

The samples examined have been collected at irregular intervals during a period of nearly one year, and represent both winter and summer conditions. In Table III are given the results obtained. The period between successive examinations of milk from the same animal varies widely from a day to several weeks.

TABLE III.—*Quantitative bacterial content of machine-drawn and hand-drawn milk.*

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Machine-drawn.																
Christiana	1,170	18,170	390	100	600	540	980	890	1,090	1,000	2,350	....	....	....	....	....
Countess	310	2,770	17,650	5,330	3,110	11,750	3,810	3,530	1,750	1,460	1,690	1,230	....	....	....	....
Dorine	21,850	2,580	65,200	126,000	56,500	59,500	11,330	14,120	14,600	27,700	5,960	16,440	33,300	14,700	7,730	5,900
Double Time	15,700	490	9,000	2,720	310	8,800	1,500	10,600	....	....	....	....	....	....	....	....
Hannah	27,950	....	2,020	16,950	1,880	4,700	10,000	2,560	2,300	3,890	3,790	1,050	960	1,280	3,040	1,600
Josephine	2,460	2,160	6,270	3,230	5,380	2,470	950	1,170	1,940	4,240	2,060	2,490	2,440	1,770	....	....
Just in Time	1,140	1,830	1,960	3,820	5,680	2,680	1,740	1,410	2,480	2,210	2,170	2,950	....	....	....	....
Jewel	7,000	2,030	174,000	2,130	1,320	4,930	4,500	8,330	....	....	....	....	....	....	....	....
Jessie	660	1,580	121,000	1,390	10,100	32,700	4,880	1,980	1,260	3,070	2,020	4,190	4,480	1,010	2,050	9,410
Maggie	380	1,840	1,390	100	1,180	1,540	1,030	330	730	1,100	2,250	11,100	....	....	....	....
Ormsby	140	140	210	180	310	150	1,290	840	440	2,660	1,130	340	400	330	....	....
Perchance	3,070	890	790	2,360	2,530	410	1,510	590	4,770	1,310	1,250	320	....	....	....	....
Hand-drawn.																
Alma	5,510	1,870	4,410	4,300	4,640	2,450	4,880	4,520	....	....	....	....	....	....	....	....
Brownie	14,560	19,930	8,660	15,130	25,400	23,300	11,500	5,230	13,430	4,110	11,000	23,200	18,850	100.750	14,400	14,160
Irma	10,900	2,300	892,000	137,000	4,810	6,280	7,030	9,710	6,600	1,320	3,460	10,840	....	....	....	....
Jeanette	190	9,830	5,910	6,400	1,260	300	830	....	....	....	....	....	....	....	....	....
Johanna	600	320	1,190	4,460	7,290	19,330	32,800	....	....	....	....	....	....	....	....	....
Jewel	1,830	3,630	4,010	390	16,600	....	....	....	....	....	....	....	....	....	....	....
Joe	560	950	510	510	1,110	....	....	....	....	....	....	....	....	....	....	....
Muriel	1,730	6,860	27,000	4,330	16,260	3,480	2,050	2,840	3,180	2,370	2,590	....	....	....	....	....
Macella	3,650	870	1,580	630	560	1,020	920	2,070	1,020	1,560	2,440	56,500	6,140	6,530	....	....
Merney	2,480	1,060	150	370	1,420	8,530	1,700	170	270	....	....	....	....	....	....	....
Margaret	330	640	250	4,940	7,630	4,810	2,200	3,730	3,680	2,330	2,930	1,600	1,860	1,300	....	....
Marie	31,420	12,000	11,100	41,200	40,760	6,000	6,020	....	....	....	....	....	....	....	....	....
Mollie	1,130	190	180	1,610	....	....	....	....	....	....	....	....	....	....	....	....
Priscilla	14,300	1,230	2,180	500	1,330	....	....	....	....	....	....	....	....	....	....	....
Sadie	3,130	3,430	4,870	5,750	10,000	910	17,400	1,150	830	350	1,000	....	....	....	....	....

One hundred and fifty samples of machine-drawn milk were examined. Of these 22 per cent contained less than 1,000 bacteria per cubic centimeter, 55.3 per cent contained between 1,000 and 5,000, and 22.7 per cent more than 5,000 per cubic centimeter. Of the 136 samples of hand-drawn milk 19.8 per cent contained less than 1,000 per cubic centimeter, 44.1 per cent from 1,000 to 5,000 and 36.1 per cent more than 5,000 per cubic centimeter. The results are thus slightly in favor of the machine.

It was thought that by the examination of a large number of samples the differences due to the variation in the contamination from the interior of the udder of different cows could be excluded and that the average of all results would be of value. A brief glance at the table will show that this is not the case. For example, the total number of bacteria found in the 137 samples of hand-drawn milk was 1,988,100. In sample No. 3 from Irma were found 892,000 and in No. 4, 137,000. Thus in these two samples as many bacteria were found as in the remaining 135 samples. If composite samples had been examined instead of those from individual animals, the large number would have been attributed to the hand-milking. The real cause of the increase was, however, a slight attack of mammitis, which was detected through a microscopic examination of the milk made for another purpose. The attack was not severe enough to be noticed by the milker, nor to produce any apparent change in the milk. Such cases, which are constantly occurring in large herds, make it difficult to obtain a clear idea of the comparative amount of contamination with the two methods of milking unless the work is continued daily for long periods of time. These slight attacks of udder trouble are undoubtedly one of the causes of the occasional high bacterial count obtained by dairies attempting to produce milk with a low germ content.

It is impossible to give in tabular form the dates on which the various examinations were made. From all the data at hand it is evident that the bacteria in the machine-drawn milk came largely from the interior of the udder, examinations made on successive days giving similar results. Marked variations in the germ content of the milk of individual cows were noted only when the examinations were made at greater intervals. With hand-drawn milk the results are more erratic, varying widely from day to day, as would be expected when it is remembered that a portion of the bacteria are carried into the milk with the dirt from the animal. The quantity of such dirt varies from day to day.

The bacterial content of the machine-drawn milk is not the lowest that can be attained. If the production of a very high grade of milk is the end sought the teats should be well cleaned before attaching the machine. Considerable quantities of air are drawn into the machine through the vent at the juncture of the teat cups and through the vent in the can cover. Unless these vents are provided with clean dry cotton filters the major part of the air-borne bacteria find their way into the milk. During most of the time when samples were being taken no especial care was taken to keep the cotton dry. It has always been replaced once a day. The importance of the air contamination has been noted by Stocking.*

It seems evident that under similar conditions as good results can be obtained with the machine as by hand. Under ordinary farm conditions where the cows are more or less soiled, undoubtedly better results can be obtained by the machine than by hand, providing the machine is operated in an intelligent manner. If the teat cups are allowed to come in contact with the stable floor so that large amounts of dust may be sucked into the can, a milk with low germ content can not be expected.

QUALITATIVE BACTERIOLOGICAL EXAMINATION.

It was thought that an examination of the samples of milks as to the various kinds of bacteria present and the relative proportion of each would be of value. For this purpose, lactose-litmus-gelatine, as recommended by Conn, was used. After a few trials it was evident that nothing would be gained from this work under such conditions as obtained in the University barn.

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*Bul. 47, Storrs Expt. Sta.

The presence of large numbers of liquefying organisms is usually regarded as an evidence of contamination with barn dust and filth. The acid organisms come largely from the exterior of the animal and from utensils, while those classed as non-liquefying organisms and slow liquefiers, or pitted liquefiers, are largely from the interior of the udder. The results obtained have been brought together in Table IV. These counts were made on plates after ninety-six hours incubation at 20°C.

TABLE IV.—*Qualitative bacterial content of machine and hand-drawn milk.*

	Liquefying bacteria.	Non-acid non-liquefying bacteria.	Pitted liquefying bacteria.	Acid bacteria.
	Per cent.	Per cent.	Per cent.	Per cent.
Machine-drawn	6.0	55.8	12.0	26.6
Machine-drawn	0.2	50.9	24.4	24.4
Machine-drawn	0.0	42.2	40.6	17.1
Machine-drawn	10.9	54.6	7.4	27.5
Machine-drawn	5.2	41.1	13.7	40.0
Average	4.4	48.8	19.6	27.1
Hand-drawn	3.8	67.4	4.4	24.8
Hand-drawn	14.6	52.5	3.6	42.5
Hand-drawn	11.6	59.4	0.0	30.6
Hand-drawn	11.2	61.8	2.6	24.7
Hand-drawn	2.5	69.8	9.7	17.0
Average	8.9	62.1	4.8	27.9

From the table it will be seen that there are no marked differences in the two classes of milk with reference to the relative number of different kinds of bacteria present, the machine-drawn showing somewhat lower content of liquefying bacteria. This would be expected from our knowledge of the source of this type. The acid bacteria are practically the same in both milks. The non-acid, non-liquefying and pitted liquefying types of organisms that come largely from the interior of the udder are also much the same in the different kinds of milks.

Keeping quality.—The keeping quality must be measured by the rate of development of acidity, or by noting the time of curdling, hence it is directly dependent upon the number of lactic acid bacteria that gain entrance into the milk. Stocking's work* has made it clear that the keeping quality of various samples of milk may be much the same, though the original bacterial content may be widely different. With the slight differences that existed in the bacterial content of the hand-drawn and machine-drawn milk, it was evident that determinations as to keeping quality would show no marked differences. In Table V are given the results obtained from a number of trials made with composite samples from four animals.

TABLE V.—*Rate of development of acidity in hand and machine-drawn milk.*

	Sample No.	PER CENT OF LACTIC ACID AFTER—			
		24 hours.	48 hours.	72 hours.	96 hours.
Machine drawn	1	0.16	0.18	0.20	0.75
	2	0.16	0.16	0.57	0.72
	3	0.16	0.18	0.30	0.75
Hand drawn	1	0.18	0.21	0.40	0.80
	2	0.18	0.21	0.83	0.90
	3	0.18	0.20	0.83	0.90

Sample No. 1 of hand-drawn and sample No. 1 of machine-drawn milk were taken at the same milking, hence represent comparable conditions as to temperature of incubation. The same is true for the other samples. It is to be noted that while the differences were so small as to be of no practical importance, they were always in favor of the machine-drawn milk.

Conclusion.—The data presented, while not large in amount, are sufficient to show that under such conditions as obtained in these trials with reference to cleanliness of machine and other utensils, the condition of the animals and the amount of dust in the barn air, the use of the milking machine will produce milk with as low a germ content or even lower than that drawn by hand.

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*Loc. cit.

TUBERCULOSIS TESTS FOR 1906-1907.

H. L. RUSSELL

Last year special efforts were made to induce the farmers of the State to employ the tuberculin test more freely than had previously been customary. This campaign has been carried on through the medium of the agricultural press and the issuance of a number of bulletins from this Station relating to various phases of the disease of bovine tuberculosis.

During this year this effort has been extended and a considerably larger number of tests secured under the auspices of the Experiment Station than in the preceding year. The plan followed has been essentially the same as was in vogue before. By means of the post-mortem demonstrations at fairs, local institutes, and at the Agricultural College, the attention of farmers has been directed especially to the necessity of investigating the condition of their own herds with reference to this disease. Wherever such slaughter tests have been made it has led to a wide extension of the test. The owner himself has come to realize that the use of the test is the cheapest means of live stock insurance against this disease. By far the larger percentage of tests has been performed by our second-year Short Course students, numbering from 100 to 150 every year, and by the members of the Farmers' Course, numbering from 500 to 600 a year. These men have been given specific instruction with reference to the application of the test. They return to their respective homes and in large measure apply the test first to their own herds and then become leaders in the movement in their respective communities. In a number of instances graduates of our Short Course have given a considerable part of their time during the winter months to the testing of their neighbors' herds at a relatively small expense. The injection of the tuberculin and the taking of the temperatures before and after injection are made by these individuals and in all cases the record sheets of these operations are transmitted to the Experiment Station for interpretation. Our invariable rule is that all persons securing tuberculin from the Experiment Station shall make a report upon the use of this material, and it has been gratifying to see how extensively the farmers have availed themselves of this free distribution of tuberculin, and have done all in their power to perform their part of the agreement. No tuberculin is sent out from this College unless the owner will agree to use it within a reasonable period of time after its receipt; to submit a careful and true report of all temperature records taken; he agrees, further, if any animals in the herd are found to react to the tuberculin test, to remove these at once from the healthy portion of the herd so as to prevent further spread of the disease, and not dispose of them to any person, unless the transaction is satisfactory to the Experiment Station. If upon the receipt of the report animals are found which reacted to the tuberculin test, the matter is then referred to the State Veterinarian, who is the Executive officer of the Live Stock Sanitary Board. If the test is satisfactory to this official, disposal of reacting animals is made in accordance with the regulations of this Board and owners are re-imbursed in the usual manner.

In carrying on the campaign in this manner it is our intention to make it largely educational so as to acquaint the stock owner with the gravity of the problem which confronts him and show him the course of action which should be followed in handling his herd. There would, of course, be considerable danger in this method of education, if the tuberculin test were placed unrestrictedly in the hands of the individual owners without any previous instruction. It is our belief that the more progressive stock owners of the State can easily learn how to apply this test to their own herds and will be more willing to use the same (and therefore profit from the results obtained), than would be the case if performed by professional experts only. The Station has sent out during the past two years large quantities of tuberculin which have been used in the main by students and farmers who have had previous experience and considerable instruction with reference to the application of the test; also a considerable amount has been furnished veterinarians, both qualified graduates and those practicing this profession, but unlicensed. In our experience the test sheets submitted by the former non-professional class have been very satisfactory. This experience has led us to extend the use of the test in this manner as widely as possible, believing that such work will more rapidly educate the stock-raising community to a proper realization of the necessity of using this diagnostic method than will the more conservative method of having the test applied only by professional experts. So far, the education of the masses relative to this matter has been of much importance, but now there is scattered throughout the State an increasing number of individuals who have had sufficient experience in the application of the test to use it with safety.

THE RESULTS OBTAINED.

The popularity of this course of action is strongly attested to by the marked development which has occurred in this work during the last two years. With the inauguration of this method in 1905-1906, the number of tests was increased about eight-fold over the year before and, as shown in Table I, the increase during the present year has even doubled that of last year. These results embrace the work for the ordinary testing season which is from October to the following May or June. Very little testing is done during the summer months. In considering the work of this character that has been performed in the State, it should be remembered that there are doubtless several times the number of animals tested as are here reported. The State Veterinarian, under the auspices of the Live Stock Sanitary Board, has also been very active in this work. He reported over 5,000 tests made to July 1, 1907. Besides these there are undoubtedly a great many private tests concerning which we have no definite figures.

In Table I is presented the summary of the testing records accumulated by the Experiment Station during the past six years.

TABLE I.—*Summary of tuberculin tests made in Wisconsin under auspices of the Experiment Station.*

Year.	Number of herds tested.	Number of herds showing reactions.	Number of animals tested.	Number of animals reacting.	Per cent of animals affected.
1901........	22	10	425	84	19.7
1902........	14	5	306	42	13.7
1903........	11	4	182	5	2.7
1904.......	33	13	685	44	6.4
1905........	41	17	726	44	6.0
1906........	339	146	5.781	704	12.0
1907........	630	171	10,740	469	4.3

Of course it is impossible to draw any definite conclusion from data so meager as the above, and yet from the work done the past two years, it is gratifying to note that there has been a marked decline this year not only in the number of reacting animals found, but in the proportion of herds containing affected animals. Last year, of the 339 herds tested, 43 per cent contained one or more tuberculous animals, while this year 27.2 per cent were found to be so affected. In a large number of herds only one or two animals reacted. An early recognition of this condition is of the greatest value as it permits of the separation of the affected stock before the disease spreads to many others in the herd.

In order to show the distribution of the disease throughout the State,.the data collected have been classified by counties as indicated in Table II.

TABLE II.—*Tuberculin tests for 1906–1907, by counties.*

County.	Number of herds tested.	Number of herds affected.	Number of animals tested.	Number of animals reacting.
Adams	1	1	10	2
Ashland	1	1	25	4
Bayfield	3	1	20	1
Barron	22	0	203	0
Buffalo	1	1	29	1
Clark	14	0	377	0
Calumet	2	1	22	6
Columbia	7	2	100	5
Dane	116	50	2,635	161
Dodge	19	3	397	3
Door	1	0	10	0
Dunn	3	0	66	0
Eau Claire	6	1	108	1
Fond du Lac	45	14	858	42
Grant	4	1	92	3
Green	3	2	133	3
Iowa	6	0	173	0
Iron	1	0	19	0
Juneau	1	0	3	0
Jefferson	130	10	871	41
Kenosha	2	1	213	10
La Crosse	7	0	123	0
Lafayette	7	3	160	4
Lincoln	2	0	19	0
Marathon	3	1	132	1
Manitowoc	6	3	78	3
Marquette	4	1	54	1
Monroe	12	4	200	5
Milwaukee	1	0	23	0
Ozaukee	2	0	59	0
Outagamie	5	0	109	0
Portage	1	0	17	0
Polk	4	1	62	1
Pepin	1	0	7	1
Racine	7	[illegible]	73	4
Richland	2	0	29	0
Rock	11	4	163	4
Sheboygan	10	5	193	9
Sauk	3	0	31	0
Shawano	1	0	18	0
St. Croix	3	2	100	2
Taylor	2	1	21	5
Trempealeau	2	1	17	1
Vernon	9	2	165	2
Waukesha	57	17	1,145	51
Waupaca	16	3	243	4
Walworth	51	28	1,142	69
Washington	1	0	28	0
Waushara	2	0	17	0
Washburn	1	0	2	0
Wood	5	1	29	1
Winnebago	1	1	24	19
	630	171	10,740	469

During this year tests were reported from 52 of the 71 counties in the State, although reacting herds were confined to 32 of the 52 counties. So far as this year's tests are concerned, by far the larger part of affected herds was discovered in Dane, Fond du Lac, Jefferson, Waukesha, Walworth, and Kenosha counties. In Dane and Waukesha counties especially, rmers have been aroused by the post-mortem demonstra- that have been held. The pronounced activity in other ies has been caused in the main by the discovery of sev- adly affected herds. Naturally the majority of the tests de in the older dairy regions in the southern and east- ortions of the State, but in a goodly number of cases the rs of the more northern counties have taken hold of this r energetically. This is indeed fortunate, for an early mination of the actual condition of the herds in this developing dairy region will undoubtedly save owners much greater losses later.

comparison of the statistical data gathered in the two por- of the State reveals some important conclusions. If we ly separate the State into two sections, the northern two- s and the southern one-third, by a boundary line running east to west along the southern border of La Crosse, oe, Juneau, Adams, Marquette, Green Lake, Winnebago, net, and Manitowoc counties, and study the distribution e disease, not only as to number of animals affected, but as to number of herds involved, the startling conclusion ident that tuberculosis in cattle has already established firmly in the central and northern counties of the State

TABLE III.—*Distribution of tuberculosis in Wisconsin.*

	NORTHERN SECTION.						SOUTHERN SECTION.					
ar.	Number of herds tested.	Number of herds affected.	Per cent affected.	Number of animals tested.	Number of animals reacting.	Per cent of animals affected.	Number of herds tested.	Number of herds affected.	Per cent affected.	Number of animals tested.	Number of animals reacting.	Per cent of animals affected.
6.. .	87	21	24.1	1,317	30	2.2	218	125	57.5	4,525	696	15.3
7......	134	25	18.6	2,063	58	2.8	503	152	30.2	8,809	423	4.6
al.....	221	46	20.8	3.380	88	2.6	721	277	38.4	13,334	1,119	8.8

om the above table it is evident that while there is much tuberculosis in the older dairy regions of the State, not absolutely as to percentage of reacting animals, but also percentage of herds found to contain tuberculous ani- , the condition with reference to this disease in the newer regions of central and northern Wisconsin is such as to require immediate attention. From the results which were collected from herds on which no especial suspicion rested, the percentage of reacting animals was small, averaging only 2.6 per cent, but what is of much greater importance is the fact that one-fifth of the herds examined were found to contain the disease. Unless this matter is taken hold of by the stock owners, it will be only a comparatively short time before the disease will spread from animal to animal in the herd, the same as has been the case in the southern part of the State. It is too bad to see the splendid possibilities of this most excellent dairy region blighted at the outset by this insidious disease

DISTRIBUTION OF CELL ELEMENTS IN MILK AND THEIR RELATION TO SANITARY STANDARDS.

H. L. RUSSELL AND CONRAD HOFFMANN.

The various methods which have been introduced to control the wholesomeness of milk supplies have thus far dealt with two different sets of conditions:—

(1) The determination of the presence of micro-organisms that have found their way into milk mainly through careless methods of handling.

(2) The detection of abnormal conditions in milk arising from its condition in the udder.

Among the more important test methods under the latter head are included:—

(a) The determination of special types of organisms, such as the streptococci that are presumed to be associated with the production of certain udder diseases.

(b) The supposed presence of pus, by the determination of pus cells, or the detection of associated elements, such as fibrin.

The actual detection of disease-producing organisms in milk is exceedingly difficult under most conditions and no reliable method exists that is of much service for routine inspection of this character. Fortunately, there are not many diseases which occur in the cow, that also affect man. Tuberculosis is by far the most important of this class.

On the other hand, cattle not infrequently suffer from udder troubles—gargets of various types, in which inflammatory processes of varying degrees of severity may occur. In som cases these may be so slight as apparently not to affect the n ture of the milk. Often, however, the milk may become vi cous, sometimes [illegible] stringy, and may even be of a [illegible] nature. Occasionally such troubles as these develop into an a vanced stage, in which pus is actually present in such quant ties as to be easily recognizable. Milks of this character shoul of course, be excluded from food supplies. In these cases, whe a physical examination reveals an abnormal condition, a m croscopic study naturally presents a far different picture fro that which obtains in apparently normal milk. One of th prominent microscopic features in the case of milk that abnormal at time of withdrawal is the presence of an u usually large number of certain blood elements, known as th white blood corpuscles, or leucocytes. In case pus is at a observable, these cellular elements are present in enormou numbers. Generally they can be detected, even where n physical signs of pus are apparent. The fact that milks know to be associated with abnormal conditions in the cow ofte contain these elements in such large numbers has led to th suggestion that all milks rich in leucocytes should be regard with more or less suspicion.

Histologically it is not an easy matter to differentiate b tween pus cells and the normal leucocytes, or white blo corpuscles. These latter cellular elements are, of cours normal constituents of blood, and are also found in variab quantities in milk supplies. It is quite probable that son of these cellular elements found in milk are derived from th gland tissues and are not leucocytes, although, upon stainin the majority of the cells belong to that type which is know as the polymorphonuclear which is so abundant in pu Thus far, emphasis has been placed on the quantitative rath than the qualitative relation of these cells in milk. Wha ever may be their nature, they are at present considered associated with pus, if they are found abundantly in the mil

The presence of a large number of leucocytes, either i blood or milk, is generally regarded as indicating an irrit on of an inflammatory character, but the important question , what constitutes an abnormal number? How many leuco- tes can be present in milk before it should be considered at suppuration has taken place? The standards, so far osen, have been more or less arbitrarily selected on what pears as rather inadequate data, and, from a comparison of sults, it is apparent that much more comparative work needs be made. Even the technical methods by which the leuco- tes are determined do not show harmonious and constant sults, and the interpretations placed upon the data ob- ined vary still more.

The formulation of these standards for milk inspection has ready led to much dissatisfaction and complaint on the part the dairy interests. In a number of cases, even certified pplies which have been handled with great care have been jected on account of the high leucocyte content found in em, although the closest veterinary inspection failed to re- al the presence of any udder abnormality. We quote from recent correspondent:—

> The city chemist of ——— is taking steps to condemn 35 to 75 r cent of the dairy cows of this country for alleged discovery of pus the milk. He has condemned 16 out of 35 in our herd, and in the se of some dairymen, 90 per cent of their herds. The cows are in od condition and the veterinarian from the State University has ex- nined my herd, and pronounced their general condition good, and eir udders perfect. There is absolutely no sign of inflammation.

In a letter from Dr. S. McC. Hamill of Philadelphia, who the secretary of the Milk Commission of the Pediatric So- of that city, says:—

> me of the best herds, even those producing certified milk, have publicly condemned and brought into disrepute. It has not been n by anyone that milk high in leucocytes has any injurious effect, has it been shown that their presence meant *per se* inflammatory ges in the udder.

s secretary of this commission, Dr. Hamill enters a vigor- protest against the attitude of the city board of health, ch is enforcing a standard whereby milk supplies are con- nned in which are found 100,000 or more leucocytes per ic centimeter.

While this question is engaging the attention of laborator
men in public hygiene, it is of the utmost importance that th
whole subject be studied from the dairyman's point o
view as well. For this reason it has been considered advi
able for the Experiment Station to undertake a thoroug
study of the whole question so that just and equitable stan
ards for both the milk producer and milk inspector might b
determined.

I.—DEVELOPMENT OF TECHNICAL METHODS OF EXAMINATIO

Before it is possible to formulate any satisfactory standar
on which milk supplies should be accepted, it is necessary
perfect the methods of examination whereby such quantitati
determinations are made. In determining the number an
character of the cellular elements in milk, recourse has bee
had to the use of the centrifuge, which is so universally em
ployed in all blood work of a similar character. In the mai
two methods have been suggested for the quantitative est
mation of the white blood corpuscles which are here to be co
sidered. Both of these methods consist of concentrating th
cellular elements of a sample of milk by the process of centrif
galization and then examining the sediment so secured
either of the following ways:—

(1) By smearing the sediment so secured on a glass sli
of definite dimensions, and examining the preparation in
stained condition with a one-twelfth inch oil immersion len
noting the number of leucocytes per microscopic field. Th
method was devised by Stokes* of the Baltimore Board
Health and has later been somewhat modified by Bergey
Stewart‡ of the Philadelphia Bureau of Health, and Slac
of the Boston Board of Health.

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*The Microscopic Examination of Milk, Jour. of State Med., 1897,
p. 439. Also Ann. Rept. of Health Dept. of Baltimore 1897, p. 105.

†Source and value of bacteria in milk. Bul. 125, Dept. of Agr. Pen

‡Amer. Med. Vol. 9, No. 12, p. 486.

§Technol. Quart. 19, 1906, No. 1.

(2) A second method was originally suggested by Doane*, the details of which are in general the same as those which are used in the accepted quantitative method for the determination of cellular elements in the blood. Ten cubic centimeters of milk are centrifugalized in sedimentation tubes. The cream is then removed by means of a cotton swab and the remaining liquid treated in the same manner a second time, thus eliminating the fat.

The supernatant milk is then siphoned off until one-half cubic centimeter remains. Water is then added to the collected sediment bringing the same to the one cubic centimeter mark in the sedimentation tube, and the whole thoroughly emulsified and stained in bulk with methylene blue. The quantitative determinations made from this material are secured by means of a ruled blood counter of the Thoma-Zeiss pattern.

A third method which has more recently been proposed is hat of Trommsdorff† which consists in determining by direct estimation the actual volume of the sediment obtained by cenrifugalizing a given quantity of the milk in question.

COMPARISON OF METHODS OF EXAMINATION.

Our studies were first directed toward a comparison of the rst two methods described, which are frequently referred to the literature, as the Stokes-Stewart and the Doane-Bucky methods respectively.

In order to determine their relative accuracy, a considerable mber of duplicate examinations were made upon the same mple of milk by the two methods above mentioned. These ta are incorporated in Table I, from which it appears that e results obtained by the second method (Doane-Buckley) e much more harmonious than those secured by the smeared-diment method. The average percentage variation in duplite examinations in the smeared-sediment method was very reat (112 per cent), while that of the other method rarely ver exceeded more than 20 per cent, and in these 23 tests averaged less than 6 per cent.

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*Bul. 102, Md. Expt. Sta., 1905.

†Archiv Hyg. 59 (1906) No. 3, p. 224.

TABLE I.—*Comparative examination of leucocytes per cubic centimeter in milk as determined by the two methods proposed.*

Sample.	VOLUMETRIC (DOANE-BUCKLEY) METHOD.				SMEARED-SEDIMENT (STEWART) METHOD.			
	First examination.	Second examination.	Average.	Percentage variation.	First examination.	Second examination.	Average.	Percentage variation.
1........	590,625	700,000	645,310	18.0	403,200	238,500	320.850	69.0
2........	325,000	288,750	306,875	12.0	16.200	113,400	64,800	587.0
3........	1,012.500	975,000	993,750	3.7	99,100	154.000	126,560	55.4
4........	11.250	12.500	11,875	11.1	4,500	16,200	10,360	260.0
5........	701,250	687,500	694,375	2.0	82,870	146,830	114.850	77.1
6........	146,250	155,000	150.625	5.6	136,020	120,700	128,380	12.6
7........	20.000	20,000	20,000	0.0	19,810	18,900	19,370	4.7
8........	193,750	187,500	190,625	3.3	153,900	111,700	132,800	37.7
9........	881,250	901,250	891,250	2.2	366,300	517,500	441,900	41.2
10........	50,000	50,000	50,000	0.0	0	9,000	....	....
11........	42,500	51,250	46,875	20.0	63,000	76,560	69,810	21.4
12........	413,750	422,500	418,125	2.0	135,210	150,430	142,820	11.2
13........	10,000	10,000	10,000	0.0	2,250	13,510	8.880	500.0
14........	438,750	425.000	431,875	3.2	193,670	145,930	169,800	82.5
15........	125,000	132,500	128.750	6.0	0	17,115	....	....
16........	4.680	3.900	4,290	10.0	1,350	0	....	....
17........	87,500	90,000	88,750	3.0	40,530	9,000	24,760	350.4
18........	543,750	537,500	540,625	1.1	281,650	152,235	218,440	87.0
19........	443,750	443.750	443,750	0.0	275.640	276,545	276,095	0.3
20........	222,500	231,250	226,875	4.3	126,110	159,440	142,775	26.4
21........	245,000	247,500	246,250	1.0	174.750	202.680	188,720	16.0
22........	1,076,250	1,057,500	1.066,875	1.7	439,590	545,885	492,740	24.2
23........	142,500	125.000	133,750	14.0	71,180	87,375	79.280	22.7
Average.................... 5.6 per cent.					Average .... 112 per cent.			

It is noteworthy in the above that, quantitatively, higher results were almost uniformly obtained by the Doane-Buckley method than by the Stokes-Stewart method and it is therefore necessary that this fact be taken into consideration in the proposal of any standard.

Ward has also reported a comparison of these two methods,* and has reached practically the same conclusion.

MODIFICATIONS IN TECHNIQUE.

In working with the Doane-Buckley method we have, however, made a number of minor changes, not only in the preparation of material but also in the examination of the sediment. The most important variation in technique is in the preparation of the milk for examination, as a result of a suggestion made by Dr. B. H. Stone of the Vermont State Laboratory of Hygiene. Dr. Stone reported that in his experience the leucocyte content of pasteurized milks was higher than that of raw milks. To ascertain the correctness of this statement a series of studies was undertaken, the result of which led to a material change in the methods of preparation.

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*Rept. Cal. State Board of Health, 1905–1906, p. 142.

INFLUENCE OF PRELIMINARY HEATING.

Where samples of milk were divided, and one portion heated to 70° C., it was found in the great majority of instances that a considerable increase in the number of cellular elements occurred. Thus out of sixty examinations made on milks of different animals, fifty showed a marked increase in the number of cellular elements in the heated samples, the percentage increase being usually so striking as to indicate beyond all question that the difference exceeded the usual limits of analytic error. In all but five cases where the heated sample showed a less number than the raw, the difference was well within the analytical error. To ascertain the cause of this increase in the number of leucocytes found in the heated samples, another series of experiments was instituted in which samples of the same milk were examined in a raw condition; also where heated at different temperatures ranging from 50 to 80° C. The results of these examinations showed that the most marked increase occurred between the temperatures of 60 and 70° C.

Inasmuch as the application of heat to a temperature above 60° changes materially the distribution of the fat globules in the milk, it was thought that this increase in leucocytes in heated milks might be attributable to the more homogeneous distribution of the fat throughout the milk serum. The fat globule clusters, which are found in normal milk probably entangle many of these cellular elements, but with a more homogeneous emulsion, due to the action of the heat, many of the leucocytes are not thus enmeshed, and are therefore free to respond to the action of gravity. If milk is allowed to cream naturally by gravity a marked differentiation in the distribution of the leucocytes in the cream and skim milk so obtained is to be observed. Naturally the cream is found to contain more than the skim milk, but the ratio between those found in the cream and in the skim milk increases rapidly with the more complete separation of the fat. For instance, in samples of milk allowed to stand for approximately twenty-four hours, the number of leucocytes in the skim milk compared with those in the cream was as 1:4–5.

With a longer period of separation the number of leucocytes in the skim milk was rapidly reduced, until in milk held for three days, the ratio between the number in the skim milk and in the cream was as 1:123.

Further experiments were made to test this hypothesis by taking a sample of milk, heating a portion of the same, and then allowing the creaming process to go on as before in which case the cream was found to contain far fewer leucocytes and the skim milk many more than before.

To complete these studies, determinations of the number of cells in the supernatant fluid of unheated and heated samples of milk were made. These clearly indicated that often a large percentage of the leucocytes is ordinarily lost through the cream where unheated samples were used. In 14 sets of examinations this loss ranged from two to seventy per cent and averaged 24.5 per cent. In the samples of milk heated prior to centrifugalization this same factor averaged only 3.5 per cent with a range from 1.1 to 8.4 per cent.

This modification of the method, viz, the heating of the milks to 60° or 70° C., prior to centrifugalization permits of surprisingly consistent results on duplicate examinations, the factor of error averaging less than 3 per cent.

In accordance with the above results, all later examinations have been made with milks heated to at least 70° C. prior to centrifugalization.

Ten cubic centimeters of milk were always used. After heating as above recommended this was centrifugalized twenty minutes at 1,200 revolutions per minute in a Babcock steam turbine tester. This speed maintained for the time mentioned is sufficient to sediment practically all the cell elements suspended in the milk. In our experience we have found the number of cells in the supernatant fluid to average only 3.5 per cent.

The supernatant cream and skim milk, with the exception of the last half cubic centimeter are then removed by aspirating with an exhaust pump and then wiping the sides of the tubes with a cotton swab. This process was found far more effective and rapid than the use of the cotton swab and siphon as recommended by Doane.

After thoroughly mixing the sediment with a glass rod, enough of the emulsion is placed in an ordinary blood counter (Thoma-Zeiss pattern) to fill exactly the cell. The preparation is then allowed to stand for a minute or so to permit the cellular elements to settle to the bottom of the cell while the few fat globules in the liquid rise to the surface.

Examination of material.—The preparation is examined in an unstained condition. Most observers have usually stained the sediment prior to examination, but we have found with the above treatment that the cells may be counted quite as well in an unstained as in a stained condition. Of course, the morphological differentiation is not possible in an unstained condition but such a large proportion of cells are polymorphonuclear in type that the remainder may in ordinary routine work be disregarded. A careful differential count of the cells in 29 different samples of milk coming from 15 different cows, revealed the fact that over 90 per cent of all cells present were of the polymorphonuclear type.

The count is made with a No. 1 eye piece and a one-sixth objective. Where the number of cell elements exceeds 12 or 15 per microscopic field above referred to, one-quarter of the entire ruled area of the counter, equivalent to 100 of the smallest squares of the latter, are counted. Where the cell elements are less abundant one-half or the entire area (200 or 400 squares) are enumerated. The average number of cells per smallest square is then obtained which, when multiplied by 4,000,000, gives the number of cells per cubic centimeter of sediment. As the sediment represents the concentration of the leucocytes into one-twentieth of the original volume of milk taken (10 cc. to ½ cc.), this number should be divided by 20 to obtain the number of cells per cubic centimeter of the original milk.

The above factor is obtained as follows: the cubic content of the blood counter represents 1-10 cubic millimeter. This volume is divided by means of the scale into 400 small cubes each equal to 1-4000 cubic millimeter or 1-4000,000 cubic centimeter.

II.—STUDIES ON VARIATIONS IN CELL CONTENT OF MILK OF APPARENTLY HEALTHY ANIMALS.

In connection with the studies on the development of the technical methods of examination, a large number of determinations have been made upon the milk of individual animals from the University herd. Supplementary to these data examinations have also been carried out on other herds as well as on individual cows from a large number of herds. The preliminary studies indicated a wide range in the number of cell elements found in the milk of the same animal, so that it seemed impossible to draw any conclusion as to what constituted the normal content of milk when examinations were confined to a single individual. This fact led us to accumulate a large body of data from a considerable number of animals together with a full record of the general characteristics and conditions of each individual. This was done with the hope that perhaps some underlying law might be determined which would give some clue as to the cause of the wide variation that was observed. In considering the effect of these various conditions that obtain in each animal a summary statement will suffice, especially in the case of negative results.

Relation to different periods of same milking.—Tests were made on eighteen animals where the fore, middle, and strippings milks were collected separately. Strippings milk was found to contain on an average three times as many cells as was found in fore or middle milk. As between fore and middle milk no regularity was observed. The increase in the strippings is, however, so marked, that this factor should be taken into onsideration in the matter of sampling. It is necessary, herefore, in order to secure representative samples that they hould be collected from the whole pail milk.

Relation to different quarters of udder.—Seventy-two examinations made from the milk of the individual quarters of e udder showed wide fluctuations in the milk of the same nimal. It was noteworthy where any individual quarter howed a high content that this condition was observable rough all portions of the milking.

Physiological condition of animal.—Several observations ave been made as to whether any effect was produced upon e milk when the animal was in heat. No definite relationip to this physiological process seems to be established. The fect of parturition was also studied, but examinations of lostrum milk as to leucocytes could not be made on account f the presence of large numbers of colostrum cells and of alumen. This condition persists for a period of three or four ays after which time microscopic examinations reveal no abormal number of leucocytes.

Influence of lactation.—No particular effect can be ascribed the influence of lactation. A study of the history of the dividual cows examined shows no regularity in the fluctuaon as lactation advances. We have found wide variations the number of cells from day to day and have frequently oted a high cell content in the earlier as well as in the later ages of the period of lactation.

Relation to breed.—There seems to be no relation of cell ontent to breed of animal. Individuality is of much more nportance than any breed characteristic.

Effect of age.—The University herd contains animals rangg from heifers to cows fourteen years of age. When the colected data were studied from the standpoint of age of animal, appeared that the milk of the older cows showed on the verage a considerably higher cell content than the younger tock. Dividing the herd into two sections at six years of age, e find in the section under six a much larger number of cases which the cell content was below 500,000 per cubic centimeer, whereas in the older group, the percentage of examinations showing an excess of 500,000 cells was greatly increased. These results first led us to consider that age was a prominent factor in accounting for the high cell content, but further study of these animals revealed another condition that seems to exert a more direct influence on the variation of the leucocytes than does that of age itself. This is the physical condition of the udder itself. In a large proportion of cases the aged animals showing a high cell content revealed an abnormal condition of the udder varying from a slight localized thickening of the connective tissue to a considerable involvement of the gland.

TABLE II.—*Effect of age of animal upon leucocyte content of milk.*

Animals 6 years and under.

Number of cow.	Age of cow.	Number of tests.	NUMBER OF TESTS. Below 50,000.	Between 50,000 and 100,000	Between 100,000 and 500,000.	Between 500,000 and 1,000,000.	Above 1,000,000
20	4	41	2	8	31	0	0
29	4	35	29	4	2	0	0
28	4	44	26	12	6	0	0
26	4	57	52	3	1	1	0
30	4	31	31	0	0	0	0
22	5	11	3	4	2	2	0
11	6	48	5	20	19	4	0
14	6	41	0	0	32	9	0
2	6	38	8	10	20	0	0
31	3	15	4	4	6	1	0
32	3	28	4	9	14	1	0
33	3	27	9	5	11	2	0
35	3	20	7	10	3	0	0
43	5	14	0	0	12	1	1
Totals	....	450	180	89	159	21	1
Percentages	....	....	40	20	35.3	4.6	0.1

Animals over 6 years of age.

Number of cow.	Age of cow.	Number of tests.	Below 50,000.	Between 50,000 and 100,000	Between 100,000 and 500,000.	Between 500,000 and 1,000,000.	Above 1,000,000
9	7	63	0	0	24	31	8
24	7	16	7	23	26	0	0
10	8	47	11	15	21	0	0
12	8	38	12	13	13	0	0
16	9	56	3	7	6	0	0
27	9	23	0	4	10	2	7
19	9	48	1	0	20	20	7
8	10	20	19	1	0	0	0
15	11	48	5	20	19	4	0
Totals	....	359	58	83	139	57	22
Percentages	....	....	16.2	23.2	38.7	15.8	6.1

In order to study the influence of age apart from that of the indurated condition of the udder, the observations made on animals having a perfectly normal udder are considered separately in Table II. The larger part of these data was collected upon unheated samples but the same general relation is observed in the heated specimens. These data show that there is a marked tendency for the cell content of milk to increase with the age of the animal.

Relation to condition of udder.—A close physical examination of the herd revealed in a not inconsiderable number of cases a more or less marked induration in the udder. The cause of this condition is not readily evident, but from the history of the herd under observation, it would seem, as if, in a considerable number of cases at least, it might be associated with a previous history of slight inflammatory disturbances. Nearly all animals in the course of time suffer from troubles of this sort, ranging from a slight inflammation to a pronounced mammitis in which the milk may be profoundly affected. Such physiological disturbances are known to exert a marked effect upon the tissues and it is highly probable that when indurations are found they are to be attributed to an earlier history of a more or less pronounced garget. In the herd in question we have eliminated all animals that showed any chronic or acute inflammation of the udder. The milk of the animals here tested was apparently normal, although upon a close physical inspection, indurations of varying degree were discovered in the udder. The herd was subjected to a rigid examination by Professors Alexander and Humphrey in order to determine the quality and condition of the udder. In this way every abnormality of tissue, however slight, was taken into consideration, and we have divided the results reported below upon the basis of this physical examination, including in Group 1 those animals that were wholly free from any udder

TABLE III.—*Leucocyte content of milk from University herd.*

Group 1. Perfectly healthy animals.

No.	CONDITION.	Number of tests.	Maximum count.	Minimum count.	NUMBER OF TIMES LEUCOCY CONTENT PER CUBIC CENTMETER FELL WITHIN FOLLOWING LIMITS. 50,000 or below.	From 50,000 to 100,000.	From 100,000 to 500,000.	From 500,000 to 1,000,000.
2	Normal	38	403,750	26,250	8	10	20	0
8	Normal	20	63,750	1,250	19	1	0	0
9	Normal	63	1,966,250	126,250	0	0	24	31
10	Normal	47	388,750	8,750	11	15	21	0
11	Normal	48	751,250	20,000	5	20	19	4
12	Normal	38	216,250	11,250	12	13	13	0
14	Normal	41	892,500	137,500	0	0	32	9
15	Normal	12	341,250	128,750	0	0	12	0
16	Normal	16	216,250	41,250	3	7	6	0
19	Normal	48	1,707,500	35,000	1	0	20	20
20	Normal	41	412,500	11,500	2	8	31	0
22	Normal	11	781,250	16,250	3	4	2	2
24	Normal	56	297,000	16,100	7	23	26	0
26	Normal	57	532,500	1,560	52	3	1	1
27	Normal	23	2,191,250	58,000	0	4	10	2
28	Normal	44	334,300	6,250	26	12	6	0
29	Normal	35	143,750	8,750	29	4	2	0
30	Normal	31	46,250	1,315	31	0	0	0
	Totals	669	....	....	209	124	245	69
	Percentage of total	....	....	....	31.1	18.5	36.6	10.3

Group 2. *Animals having udder indurations of varying severity but producin apparently normal milk.*

No.	CONDITION.	Number of tests.	Maximum count.	Minimum count.	50,000 or below.	From 50,000 to 100,000.	From 100,000 to 500,000.	From 500,000 to 1,000,000.
1	Slight induration	43	2,951,250	11,250	1	7	32	2
4	Udder coarse and hard	20	4,952,500	21,300	1	0	9	6
5	Slight; one-quarter	66	1,781,250	122,500	0	0	42	19
6	Indiges; otherwise normal	19	543,750	75,000	0	2	16	1
7	Slight; one-quarter	44	250,000	7,500	17	17	10	0
13	One-quarter harder	56	1,191,250	10,000	24	6	15	8
17	Slight; one-half of udder	40	4,232,500	150,000	0	0	8	13
18	One-quarter slight (?)	62	1,801,250	28,750	6	14	33	7
21	One-quarter harder	15	1,581,250	66,850	0	3	11	0
23	Slight in one-quarter	22	4,132,500	62,500	0	3	10	6
25	One-quarter affected	45	1,068,000	8,750	7	14	20	3
	Totals	432	....	....	56	66	206	65
	Percentage of total	....	....	....	12.9	15.2	47.6	15.0

blemish whatsoever, and including in Group 2 those in which some manifestation of a past udder trouble was observable. The summary of results accumulated with respect to this history is presented in Table III, in which the maximum and minimum content of the milk from the individual cows are shown; the various observations are further arranged to show the respective number of times in which the leucocyte content came within certain specific limits.

From the above data it is apparent that any slight indurations of the udder are frequently accompanied with a high cell content and it would appear from all of the data which have been collected that the high leucocyte content of the milk of certain animals is frequently associated with such a condition. There are, however, some striking exceptions to this general rule. In the cases of No. 9 and No. 19, animals whose udders were normal, there is a wide range with a large percentage of high determinations in cellular content. In other instances among the animals of the second group where the leucocyte content is strikingly constant and relatively low, the udder frequently showed a coarse fibrous condition, which may be a peculiarity not necessarily associated with a previous inflammatory disturbance. For purposes of comparison the detailed analyses of each animal of the University herd are graphically expressed in Fig. 51 in which this prominent fact is readily observable that certain animals in the herd show a strikingly narrow range with uniformly low counts, while others present wide fluctuations.

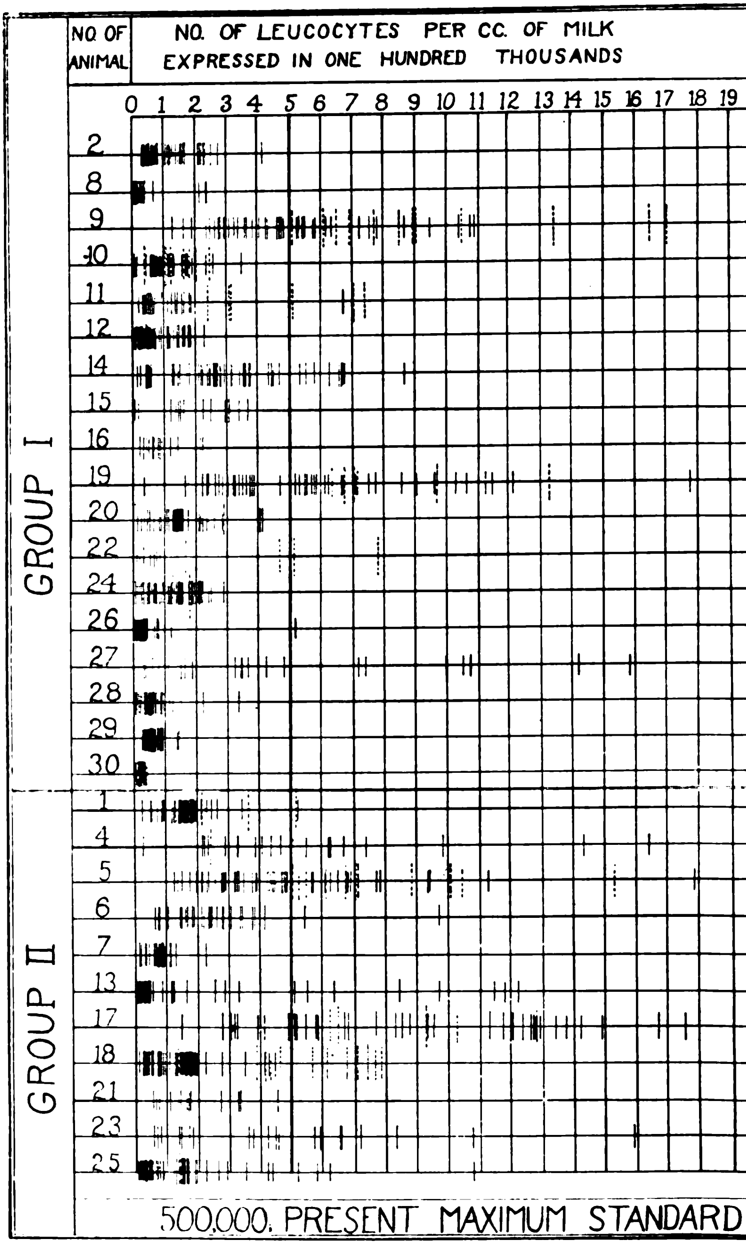

Fig. 51.—Leucocyte content of milks from University herd. Each determinat is represented by a short vertical line, dotted lines representing determi tions made on heated milks, and solid lines those made on unheated sampl Note relative proportion of cases in excess of the present maximum standa

It has been suggested that 500,000 leucocytes per cubic centimeter be taken as a possible standard for ordinary milks. On the basis of this standard, the results of our investigations would be as follows:—

Of the 669 examinations made on the 18 perfectly normal animals, 91 trials or approximately 14 per cent, showed a content in excess of this standard. In other words, the milk from these healthy cows would have been rejected 91 times on the basis of examinations of the milk from the individual animal. Of those showing an indurated condition 25 per cent of all tests made exceeded the 500,000 limit. While it appears from this that milks of high leucocyte content were obtained with considerably greater frequency (approximately twice as often) from cows with slight indurations in udders than from those showing no such condition, still it is noteworthy that practically 15 per cent of all examinations made on cows normal and healthy in all respects, showed a leucocyte content that was in xcess of the highest standard yet established. In this group f healthy animals 22 cases were observed in which the cellular ontent exceeded even 1,000,000 per cubic centimeter.

In Group 1 practically 50 per cent of all the determinaons were below 100,000, and 86 per cent below 500,000. In roup 2 but 28 per cent were below 100,000 and 75 per cent elow 500,000.

It is apparent from these studies that the leucocyte content f normal milk drawn from apparently normal animals is uite often so high that the milk would be classed as coming rom diseased animals when judged by the standards that ave heretofore been proposed. That such results are obined from animals whose records have shown no clinical hisory of a diseased condition would signify that complete reance cannot be placed upon quantitative leucocyte standards lone.

While it is undoubtedly true that cows suffering from ud-er trouble often do produce milk that is rich in leucocytes, would seem equally true that high quantitative results were ound with such frequency in milks from healthy animals as o vitiate the accuracy of a test based solely on a numerical foundation. This being true, it seems necessary to modify the limits that have been adopted by a number of cities where the acceptance or rejection of a milk supply is based upon such standards as are here considered. As interpreted at present, they undoubtedly work injustice to the dairy interests, as milk supplies would be frequently condemned which come from animals in which no clinically recognizable troubles can be ascertained.

It appears that the leucocyte content of the milk of some of the cows was remarkably uniform, while in a considerable number of cases the results were widely variable. In Group I there are eleven cows whose counts never exceeded 500,000 and only three where the number of leucocytes was ever more than 1,000,000. Of the eleven animals showing an indurated condition, all but two gave counts above 1,000,000 with only one cow whose counts never exceeded 500,000. It is noteworthy that only four of the animals of Group I, numbers 9, 14, 19, and 27, showed a variable and wide range in the leucocyte content, whereas in Group II, all but three animals showed such a range. Apparently, then, lower and more constant results are likely to be obtained with animals in which no fibrous thickening exists, than with those having some evidence of such a condition.

History of cell content in relation to udder disturbances.— In three cases within the period under study, an inflammatory disturbance of the udder occurred. In one instance the acute mastitis which developed was so severe and prolonged as to lead to a chronic diseased condition of the udder. In the other two cases the disturbances were temporary and simply cases of what would ordinarily be considered physiological garget. A study of the cell content of the milks from these animals in relation to the time of development of the attack, reveals an interesting fact.

Table IV records the examination of the milk of three cows which had an attack of garget during the experiment. The figures in bold faced type indicate a gargety condition of the milk at time of examination.

TABLE IV.—*Relation of leucocytes to occurrence of garget.*

Date of examination.	Animal No 13.	Animal No. 23.	Animal No. 3.
June 26, 1906	47,000	75,000	36,000
June 27	39,000	4,132,000	
June 29	32,000	600,000	16,000
July 2	41,000		
July 5	20,000	657,000	32,000
July 12	10 000	589,000	32,000
July 15	45,000	**1,085,000**	51,000
July 16	107,000	804,000	25,000
July 17	22,000	441,000	57,000
July 19	90,000	660,000	56,000
September 24	541,000	379,000	107,000
September 25	831,000	197,000	206,000
September 26	350,000	94,000	172 000
September 27	244,000	144,000	125,000
September 28	245,000	364,000	145,000
October 1	36,000	100,000	**2,267,000**
October 2	102,000		Gargety condition
October 3	49,000		Leucocytes bunched.
October 4	630,000	441,000	**1,287,000**
October 5	**1,191,000**	154,000	**1,104,000**
October 8	320,000	62,000	**669,000**
October 9	107,000	414,000	
October 11	62,000	172,000	**489,000**
October 15	294,000	1,595,000	**912,000**
October 16	172,000	704,000	**3,475,000**
October 17	109,000		**3,465,000**
October 18	66,000		**3,625,000**
October 19	41,000		**1,097,000**
October 20	35,000		**1,501,000**
October 21	**501,000**		**1,350,000**
October 22	**1,157,000**		**1,044,000**
October 23	**970,000**		**1,041,000**
October 24	654,000		
October 25	232,000		
October 26	275,000		
October 27	49,000		
October 28	52,000		
October 29			
October 30	49,000		
October 31, a. m	51,000		
October 31, p. m	30,000		
November 1	46,000		
November 2	25,000		
November 3.	55,000		

As is evident from this table, the approach of the garget in case 13 was indicated by a marked increase in the leucocytes but in the other cases the appearance of the trouble could not thus be foretold. In case 13 the attack was followed by a gradual decline in the leucocyte content accompanied by minor fluctuations. In case 23 the cell content subsequent to the garget, was widely variable. It is interesting to follow the history of these cases subsequent to their development. In No. 3 a high cell content was correlated with the chronic mammitis of the animal until her disposal. No data as to this animal are included in the general discussion. In the other instances, numbers 13 and 23, the udder disturbance was temporary, the milk becoming normal in the course of a few It is noteworthy in these instances, that the tendency to a high and variable leucocyte content was more marked this disturbance than prior thereto.

While, of course, these instances are too few to warran definite statement, they are suggestive as indicating a c which may occur in the cell content of cows' milk. An in which physiological garget develops often show a ten towards a repetition of such disturbances, while the mil tween times may be perfectly normal. From our studi would seem unfair, however, to exclude milk from such mals on the theory that it was diseased and accordingly for use.

Recently it has been proposed in condemning a milk fo to take into account the quantitative and the qualitative acter of the germ content, and the presence of fibrin. I ent investigators have placed emphasis upon one or the of these factors claiming that they are usually accomp by a high leucocyte content.

To ascertain how much emphasis could be placed upo various factors above referred to, a large series of exa tions were made in which their relation to the leucocyte tent was carefully considered.

Relation to bacterial content.—The relationship be the total germ and leucocyte content of cows' milk was st by collecting samples of milk aseptically into sterile one flasks and making determinations thereupon. In the c tion of the samples, the fore milk was rejected and middle milk was used. This was milked directly int flasks. Out of thirty-nine such examinations, there app to be no direct relation, although in some cases a high l cyte count was accompanied by a high germ content. Q titatively then, no relationship between the two factors mentioned exists.

Relation of streptococci.—From a qualitative standp however, there apparently was some connection, for it noted that a high leucocyte count was usually associated the presence of organisms presumably belonging to the tococcus type. Further investigation of this matter confirmed this observation. It was found to be particularly true where the leucocyte count exceeded 500,000. Thus of 154 samples showing a leucocyte count below 500,000 per cubic centimeters 56 or 36 per cent contained streptococci, while with the 34 cases where the leucocyte content was above 500,000 all but one showed streptococci. To condemn a sample of milk on the basis of the presence of streptococci and leucocytes, however, seems inadvisable, for of 188 examinations made upon the milk of apparently healthy animals, 89 or practically 50 per cent contained streptococci. The usual presumption that the presence of streptococci is necessarily indicative of inflammatory processes does not hold, for often streptococci were found in the milk from animals whose udders and general health were apparently normal in every particular.

Where a gargety condition existed, streptococci were invariably found in an almost pure culture, pointing to a specific infection. A gargety milk, however, can usually be detected by its abnormal physical condition, and would be rejected from its general appearance.

Presence of fibrin.—Another matter upon which considerable stress has been placed is that of the presence of fibrin in milk. Doane* says:—

"The presence of fibrin combined with an abnormal number of leucocytes is the only satisfactory proof that inflammation exists in the udder. Without the fibrin any serious inflammation is to be doubted."

To determine how uniform this relationship is, a large number of examinations were made, Weigert's stain and Hematoxylin being used to detect the presence of fibrin. With these stains the fibrin appears as tangled masses of very fine threads, which are stained blue. There is no regularity to these masses, and very frequently many leucocytes are seen enmeshed therein. There is no apparent difference in histological reaction between the fibrin thus found in milk and that in blood. A summary of these examinations is given in Table V.

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* Bul. 102, Md. Agr. Expt. Sta., 1905, p. 219.

TABLE V.—*Summary of fibrin examinations made in connection with leucocyte determinations.*

Leucocyte content.	Number of examinations.	Number showing no fibrin.	Number showing fibrin.
Below 50,000	15	14	1
50,000 to 100,000	10	10	0
100,000 to 500,000	37	29	8
500,000 to 1,000,000	24	11	13
Above 1,000,000	4	1	3
Total	90	65	25

Of 90 such examinations made, 62 were made on milks showing less than 500,000 cells. Of these only 9 or 14 per cent showed fibrin. Where the count exceeded 500,000, 16 of the 28 tests or 43 per cent showed fibrin. Apparently then, fibrin is found more frequently in milks where the leucocyte count is high, but as indicated above, its presence is not always strictly correlated with a high cell content, and therefore the test for fibrin, even where a high cell content occurs, cannot be regarded with certainty as indicating an unwholesome milk.

SUMMARY.

While a large body of data considered from various points of view has been accumulated in this study it is apparent that the question needs much further consideration before definite conclusions can be drawn.

It is undoubtedly true that much injury will result to the dairy industry through the enforcement of such quantitative standards as have hitherto been formulated. In our judgment comprehensive studies are a prerequisite to the formulation of any standard. Especially, should these be made on individual rather than on herd milks, and preferably on animals whose clinical history is well known. Further, the formulation of proper and accurate technical methods is imperative before any definite standard can be adopted.

It has been shown in the above studies, and also by others that the results of examination vary much, depending upon the method of enumeration used. With the Doane-Buckley method, considerably higher results are obtained than where the smeared-sediment method is employed. Our experience is that, of the two methods, the former gives far more reliable results than the latter and with the modifications proposed, can be used quite as rapidly as the other.

The conclusion seems evident from the foregoing studies, that there is a wide range in the cellular content of milks that are apparently normal and perfectly safe for ordinary use. In a number of instances this cell content has been found to be relatively low and constant, while in a large proportion of cases, wide fluctuations have been noted which were frequently much in excess of any standards that have heretofore been accepted. There are undoubtedly factors operative which underlie this peculiarity in the individual animals. From the studies made, it appears evident that the milks of older animals are more likely to show a high cell content than younger stock and that frequently this condition is associated with a previous udder disturbance, which in some instances, may leave a more or less marked indurated condition in the udder. These temporary disturbances which are really gargets of a physiological character very soon disappear, and the milk becomes wholly normal, although the evidence of such slight inflammatory disturbances may continue for a considerable period of time. So far as we have been able to find, there is no adequate reason why milks from such animals as these should be excluded from ordinary domestic supplies.

At the present time we do not feel that it is wise to formulate a quantitative standard to be used as a hard and fast line in the inspection of milk supplies. The most that can be said of leucocyte examinations at the present time is that they are suggestive rather than final. As these data have been collected upon individual supplies, and the whole discussion based upon individual rather than herd milks, it must be remembered that the tentative conclusions here presented are not to be regarded as applying to herd milks. This question must be left open for further consideration.

NITROGEN CONTENT OF SOILS AS AFFECTED BY METHODS OF FARMING.*

A. R. WHITSON, C. W. STODDART, AND A. F. McLEOD.

A study of the effect of the various methods of farming on the nitrogen content of soils was begun in 1906, and the annual report of that year, pages 160–170, contains a statement of the objects and methods of work together with the results of the first season. It is planned to study the influence of continuous cropping on clay loam soils under general farm management, and to follow this with the study of the effects of heavy applications of manure in connection with truck and special crops and also the effect of pasturing, on the nitrogen of the soil. We already have a number of determinations on soils under both of the last two mentioned conditions, but the results of these will be withheld until more complete data are obtained. It is recognized that only the average of a considerable number of samples can be considered reliable.

The following table gives the determinations of the nitrogen in the virgin and cropped soils and the estimates of its removal by crops and by leaching and denitrification. In making these estimates it has been assumed that for each bushel of wheat produced, 1.75 pounds of nitrogen have been used; for a bushel of barley or oats, 1 pound; and for a bushel of corn, 1.3 pounds; that a good crop of clover adds 100 pounds of nitrogen the year after seeding, and that manure contains 10 pounds of nitrogen per ton.

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* Second article; for first article see 23d Ann. Rept. p. 160.

—Nitrogen content of cropped and virgin soils, the changes
ed by cropping, addition in manure and clover, and loss by
trification and leaching.

Laboratory numbers of samples.	Per cent of nitrogen in cropped soil.	Per cent of nitrogen in virgin soil.	POUNDS PER ACRE.					
			Excess of nitrogen in virgin over cropped soil.	Taken by crops.	Added in manure and clover.	Removed by crops more than added by manure and clover.	Loss by leaching and denitrification.	Gain, possibly due to fixation.
277-8	.112	.244	2,640	1,800	500	1,300	1,340	.....
284-5	.094	.204	2,200	....	.....	.....	...	.....
286-7	.239	.250	220	..	....	....	...	....
288-9	.096	.150	1,080	.	.	.	...	..
472-3	.097	.181	1,680	1,950	40	1,910	.....	230
453-547	.120	.138	360	.....	...	..	..	...
477-9	.108	.171	1.260	2,360	1,200	1,160	100	..
485-6	.161	.276	2,[illegible]	2,275	1,150	1,125	1,275	...
489-491	.150	.168	360	2.300	750	1,150	..	1,190
492-3	.122	.238	2,320	2,150	350	1,800	520	...
494-5	.104	.227	2,460	2,760	1,500	1,260	1,200	...
496-7	.092	.220	2,560	2.320	350	1,970	590	.....
498-9	.125	.240	2,300	2,050	1,350	700	1.600	....
502-3	.128	.288	3,200	1,860	.	1,860	1,340	.
504-5	.146	.181	700	2,280	1,200	1,080	...	380
506-7	.066	.190	2,480	1,780	100	1,680	800	.....
508-9	.061	.094	660	2,565	1,080	1,485	.	825
511-2	.051	.133	1,640	2,340	100	2,240	500	600
513-4	.206	.285	1,580	1,865	500	1,365	215	85
516-7	.305	.388	1,660	2,280	700	1,580	....	.....
518-9	.139	.252	2,260	2.220	1,300	920	1,340	......
520-1	.148	.238	1.800	2,270	100	2,170	....	370
523-4	.165	.250	1.700	2,260	1,250	1,010	690	.....
525-6	.217	.368	3,020	2,290	100	2,190	830	.....
528-30	.098	.166	1,360	1.920	2,000	....	1,440	....
531-2	.099	.150	1,020	2,070	100	1,970	.....	950
533-4	.136	.211	1,500	2,605	2,600	5	1,495	....
535-6	.101	.197	1,920	1,190	0	1,190	730	.
537-8	.101	.156	1,100	1,750	200	1,550	.....	450
540-1	.084	.175	1,820	2,100	500	1,600	280	....

22. (277–278).—This field is on the farm of S. W. ght, two miles southwest of South Wayne. It has been l sixty years and the fertility seriously reduced. Dur- early years wheat was the principal crop. No manure n applied to the field. Five crops of clover have been

23. (284–285).—This soil is from the farm of Mr. Laughton near Platteville, and has been cropped 60 hiefly to grain without manure until its fertility has eriously reduced and the field practically abandoned. imate of the crops grown could be made.

No. 24. (286–287).—This soil is from a farm one-half mile east of Montfort. The field has been cultivated 70 years, during the first 35 of which it was cropped chiefly to wheat. During the last 35 years it has been rotated to corn, oats, and barley, which were sold off the place for 15 years. Since then some stock has been kept and the manure applied to the field.

No. 25. (288–289).—This field is on the farm of Mr. William Nugent, two and one-half miles west of Boscobel. It has been cropped 25 years to corn, oats, other grains, and hay, and has not been badly reduced in fertility.

No. 26. (472–473).—This field is on the farm of H. Lackey, two miles southwest of Waterloo. It has been cropped 60 years, 30 of which were to wheat producing 18 bushels per acre on the average; corn 5 years, average 25 bushels; oats 18 years, average 35 bushels; barley 6 years, average 28 bushels; hay for two or three years. It has had but one or two applications of manure and practically no clover has been raised. Its fertility has been considerably reduced.

No. 27. (453–547).—This field is on the farm of Mr. William Chandler near Sun Prairie. It has been cropped 55 years and exhausted. Some manure has been applied.

No. 28. (477–479).—This field is on the farm of Louis Lewellyn, Waterloo. It has been cropped 63 years and is still in a good state of fertility. Crops and estimated yields are: wheat, 30 years, 20 bushels per acre; barley, 15 years, 38 bushels; oats, 7 years, 38 bushels; and two good crops of hay.

No. 29. (485–486).—This field is on the farm of August Krueger, Watertown. It has been cropped 50 years but is still in a good state of fertility. Crops and estimated yields are: wheat, 25 years, 25 bushels per acre; barley, 16 years, 35 bushels; corn, 5 years, 45 bushels; oats, 6 years, 38 bushels; and 6 crops of hay, chiefly clover. It has been manured [illegible] times—estimated at the rate of 15 loads per acre. Samples were taken from low, level portion of the field. The field has been cropped in a four-year rotation.

No. 30. (489–491).—This field is on the farm of A. H. Bussewitz, Juneau. It has been cultivated 60 years, and the crops and yields are: wheat 25 years, 23 bushels per acre; barley, 20 years, 30 bushels; corn, five years, 45 bushels; oats, 8 years, 40 bushels; 2 crops of timothy and one of clover. It has been manured three times at the rate of 20 loads per acre. The land has improved in fertility the last few years.

No. 31. (492–493).—This field is on the farm of F. Nichols, one-half mile east of Juneau. It has been cropped 65 years and is now in a low state of fertility. The crops and estimated yields are: wheat, 20 years, 30 bushels per acre; barley, 18 years, 30 bushels; corn, 4 years, 40 buhsels; oats, 10 years, 35 bushels; white clover, 3 crops probably. It has had two applications of manure.

No. 32. (494–495).—This field is on the farm of Chas. Sette, four miles southeast of Juneau. It has been cultivated about 60 years and the crops and estimated yields are: wheat 22 years, 25 bushels per acre; barley, 12 years, 35 bushels; oats, 10 years, 40 bushels; corn, 10 years, 75 bushels; clover, five crops. This has had 5 dressings of manure at an estimated rate of 20 loads per acre. The field is now in a good state of fertility.

No. 33. (496–497).—This field is on the farm of Mr. Schumacher four miles southeast of Juneau. It has been cropped 60 years and is in a low state of fertility. The crops and estimated yields are: wheat, 22 years, 25 bushels per acre; barley, 12 years, 35 bushels; corn, 7 years, 50 bushels; oats, 12 years, 30 bushels; and 2 crops of clover; 6 crops of hay other than clover. It has had one application of manure. The field is now in poor tilth.

No. 34. (498–499).—This field is on the farm of M. H. Warren, Hartland. It has been cultivated 56 years, and the crops and estimated yields are: wheat, 22 years, 20 bushels per acre; barley, 6 years, 35 bushels; oats, 12 years, 40 bushels; corn, 10 years, 45 bushels; clover, 6 years, 2 tons. It has been manured five times at an average of five tons per acre.

No. 35. (502–503).—This field is on the farm of H. R. Ridley, three miles northeast of Hartland. It has been cultivated about 56 years, and the crops and estimated yields are as follows: wheat, 20 years, 18 bushels per acre; barley, 6 years, 30 bushels; corn, 12 years, 35 bushels; rye, 3 years, 30 bushels; and three or four crops of hay. No manure was added to this field.

No. 36. (504–505).—This field is on the farm of W. B. Matthews four miles north of Helenville. It has been cultivated over 50 years and the crops and yields are: wheat, 20 years, 30 bushels per acre; barley, 10 years, 35 bushels; oats, 8 years, 40 bushels; corn, 7 years, 45 bushels; clover and timothy mixed, 5 years, 2 tons per acre. For some time past a four-year rotation has been practiced. The field has been manured five times with an average of 10 loads per acre. The soil is deep and the subsoil is non-plastic clay.

No. 37. (506–507).—This field is on the farm of Richmond Zastrow, three and one-half miles north of Helenville, and has been cultivated about 50 years. The crops and yields have been: wheat, 20 years, 25 bushels per acre; barley, 12 years, 30 bushels; oats, 8 years, 28 bushels; corn, 8 years, 30 bushels; four crops of mixed hay. It has received one dressing of manure. The fertility has been seriously reduced by continuous cropping.

No. 38. (508–509).—This field is on the farm of Thos. Jones, four miles southeast of Dousman, and has been cultivated twenty-five years. The crops and yields are: wheat, 18 years, 25 bushels per acre; barley, 6 years, 35 bushels; rye, 12 years, 34 bushels; corn, 10 years, 60 bushels; oats, 10 years, 38 bushels; clover and timothy, 6 years with a fair yield. It has been in sheep pasture 5 years and has been manured 6 times with an average of 18 loads per acre. The fertility is still good, as shown by later yields, especially of corn.

No. 39. (511–512).—This field is on the farm of C. C. Harris, three miles south of Dousman. It has been cultivated nearly 70 years. The crops and yields are as follows: wheat 24 years, 24 bushels per acre; barley, 6 years, 30 bushels; rye, 12 years, 32 bushels; corn, 10 years, 35 bushels; oats, 12 years, 33 bushels; hay, 6 years, fair yield; pasture two years. It has been manured once. The fertility is now decidedly low. Soil is a black sandy loam about 7 inches in depth and subsoil sandy.

No. 40. (513–514).—This field is on the farm of S. L. Shepard, two and one-fourth miles east of Hartford. It has been cultivated 45 years. The crops and yields are: wheat 22 years, 24 bushels per acre; barley, 15 years, 30 bushels; corn, 5 years, 35 bushels; oats, 8 years, 33 bushels; clover, 3 years, 2 tons. It has been pastured two years and manured twice. The fertility has been seriously reduced, although by no means exhausted, as indicated in the yields given above. Subsoil is a light clay.

No. 41. (516–517).—This field is on the farm of M. Reich, three miles east of Hartford and has been cultivated 58 years. Crops and yields are: wheat, 24 years, 28 bushels per acre; barley, 10 years, 35 bushels; oats, 10 years, 40 bushels; corn, 6 years, 45 bushels; clover 3 years, 1.75 tons. It has been pastured five years and the field has been manured four times. During the latter portion of its cultivated history a rotation has been practiced. The field has to a considerable extent retained its fertility, as is indicated in the yields above given.

No. 42. (518–519).—This field is on the farm of William J. Linker two and one-half miles east of Hartford, and has been cultivated about 60 years. The crops and yields are: wheat, 22 years, 25 bushels per acre; barley, 6 years, 35 bushels; oats, 12 years, 38 bushels; rye, 6 years, 34 bushels; corn, 10 years, 30 bushels; clover, 3 years, 1.5 tons. It has been pastured one year and manured four times. The soil is deep, subsoil distinctly clay. The fertility during the later years is only moderate.

No. 43. (520–522).—The field is on the farm of John Wheeler, three miles northwest of Mayville, and has been cultivated 60 years. The crops and yields are: wheat, 25 years, 25 bushels per acre; barley, 16 years, 30 bushels; oats, 12 years, 35 bushels; corn, 6 years, 35 bushels; hay one crop. It has been manured once. During the past 12 years it has been neither seeded down nor manured. The soil is deep and fertility once excellent, as shown by the early crop yields, has been seriously reduced during the later years.

No. 44. (523-524).—This field is on the farm of Albert Pahl two miles west of Mayville. It has been cultivated 60 years. Crops and yields are: wheat, 25 years, 25 bushels per acre; barley, 12 years, 30 bushels; oats, 12 years, 38 bushels; rye, 3 years, 32 bushels; corn, 5 years, 40 bushels; clover and timothy mixed, 5 crops of about two tons. The field has been manured five times with about 20 loads per acre. During later years a four-year rotation has been practiced. The fertility is now good.

No. 45. (525-526).—This field is on the farm of Mrs. Chas. C. Everts, near Granville, and has been cultivated 62 years. The crops and yields are: wheat, 24 years, 25 bushels per acre; barley, 18 years, 30 bushels; oats, 11 years, 35 bushels; corn, 8 years, 30 bushels; and two crops of hay. It has been manured only once or twice and has had no manure or clover during the last fifteen years. The fertility has been seriously reduced, as shown by the later crops grown, chiefly corn.

No. 46. (528-530).—This field is on the farm of David Rankin, four miles northwest of Sussex and has been cultivated 59 years. The crops and yields are: wheat, 20 years, 20 bushels per acre; barley, 12 years, 30 bushels; oats, 12 years, 34 bushels; clover, 6 years, 1.5 tons; corn, 10 years, 35 bushels. It has been manured seven times with an average of 20 loads per acre. Sheep have constituted the chief part of the stock kept and the land has usually been pastured to a limited extent in the fall. The fertility is decreasing in spite of the considerable amount of manure added and clover grown.

No 47. (531-532).—This field is on the farm of Paul Heling four miles north of Sussex and has been cultivated 58 years. The crops and yields are: wheat, 23 years, 20 bushels per acre; barley, 14 years, 34 bushels; oats, 12 years, 37 bushels; corn, 9 years, 38 bushels. The field has not been seeded down and has been manured but once. Its fertility is low.

No. 48. (533–534).—This field is on the farm of Robert Howard three and one-half miles north of Templeton, and has been cultivated 62 years. Crops and yields are: wheat, 20 years, 28 bushels per acre; barley, 10 years, 37 bushels; oats, 12 years, 45 bushels; corn, 10 years, 55 bushels; and clover, 10 years, 2 tons. Crops have been grown in rotation during the last 35 years during which time the field has been manured 8 times with an average of about 20 loads per acre. The fertility is now excellent, as shown by the later crops of oats, corn, and clover.

No. 49. (535–536).—This field is on the farm of John Brodhagen three and three-fourths miles north of Templeton, and has been cultivated 38 years. Crops and yields are: wheat, 4 years, 30 bushels per acre; barley, 10 years, 35 bushels, oats, 12 years, 35 bushels; corn, 4 years, 40 bushels. The field has never been seeded down or manured and the fertility is already low.

No. 50. (537–538).—This field is on the farm of August Manke one-half mile west of Sussex, and has been cultivated about 60 years. The history of the field is not definitely known except that it has been cropped in a way similar to those mentioned above, but had no clover or manure until within the last five years, during which time it has been manured twice. The yields have usually been low.

No. 51. (540–541).—This field is on the farm of Baker Bros. four miles northeast of Whitewater. It has been cultivated 60 years. The crops and yields are: wheat, 20 years, 18 bushels per acre; barley, 5 years, 40 bushels; corn, 15 years, 38 bushels; oats, 15 years, 35 bushels; clover, twice, 1.5 tons. It has been manured three times but has not been seeded down during the last 20 years, and its fertility is now low.

In studying the results above given two or three principles are brought out quite definitely. In the first place, it is evident that the largest loss of nitrogen above that removed by crops, probably due chiefly to leaching and denitrification, has occurred in those soils which ordinarily contain a rather large percentage of that element. Of the soils studied both last year and this there are twenty-one cases in which the virgin soil contained 0.2 per cent of nitrogen or over. In sixteen out of these twenty-one cases the nitrogen loss has exceeded 500 pounds per acre, and in only five has it not exceeded 500 pounds per acre. There have been twenty-six cases in which the virgin soil has contained less than 0.2 per cent of nitrogen, and out of these, twenty-one cases in which the loss of nitrogen has been less than 500 pounds per acre above that removed by crops. This indicates clearly that the largest losses by denitrification and leaching are on soils in which the nitrogen content is originally high. The average of all cases studied this year shows that the losses from denitrification and leaching have been 29.6 per cent of that removed by crops. The average of all cases studied last year is 22.3 per cent. It is evident therefore that in the clay loam soils of moderate fertility the loss by denitrification and leaching is a small portion of the total loss, while in soils which are very fertile and contain a high per cent of nitrogen the loss is decidedly greater.

Another principle indicated is that where considerable quantities of manure have been added the nitrogen loss above that removed by crops has been much greater than where the manure has not been applied. There are twelve cases in which over 1,000 pounds of nitrogen have been added in farmyard manure. In nine of these cases the loss above that removed by crops has been over 500 pounds per acre. This seems to indicate that the nitrogen added in the form or manure, as ordinarily applied, does not accumulate in the soil, and suggests the desirability of a very careful study of the methods of applying farmyard manure to determine whether it should be applied in very small quantities annually, or larger amounts at intervals of four to six years as is the customary practice. A large number of samples have been collected bearing on this subject which have not yet been analyzed, so that further discussion of this problem is postponed until this has been done.

STUDIES ON THE IMPROVEMENT OF SAND, MARSH, AND HEAVY CLAY SOILS.

A. R. WHITSON, R. R. MARSHALL, AND E. J. DELWICHE.

I. Sandy Soils.

The experimental fields on sandy soils at Sparta and Iron River were opened in the spring of 1906, and a general outline of the plans for this work, together with results for the first year, are given in the Twenty-Third Annual Report, page 181.

EXPERIMENTS AT SPARTA IN 1907.

The field at Sparta is divided into two sections, that of the south half being laid out in three fields ultimately to be cropped in a rotation of, first, rye seeded to clover; second, clover; and third, cultivated crops—corn and potatoes. Each of these fields is again sub-divided for fertilizer tests as described in the reference above given. It is impossible, however, to get the crops started until a considerable addition of vegetable matter to the soil has been made. For the first few years, therefore, when it is impossible to get a catch of clover, non-leguminous green manuring crops will be grown, chiefly rye and buckwheat. The north half of the field is devoted to the study of the most promising legumes for the improvement of fertility.

South side of field.—Plot A, which had grown very poor crops of oats and rape during the first season, was sown to rye in April this year. The rye made a fair growth in the plots which had been treated with manure and peat but was extremely poor on the other. The entire plot was plowed and sown to buckwheat on the 12th of June. This was plowed under on the 15th of August and resown to rye, which made a fair growth during the fall.

Plot B, which had grown corn and potatoes in 1906, was seeded to oats as a nurse crop for clover in April. The oats made a light growth and were attacked seriously by rust. The yields on the manured plot and the one to which peat with potash and phosphate had been applied in 1906 were estimated at fifteen and twelve bushels per acre, respectively, while no grain was produced on the remaining plots. The clover seed germinated well, but made little growth and the entire crop was plowed under in August.

Plot C had been sown to rye in the fall of 1906 with the expectation that it would be plowed under and planted to corn and potatoes this year. However, an experiment was made on this plot planned to develop a method by which the cultivated crops would be protected from blown sand as far as possible. For this purpose the crop of rye was backset in the rows of corn and potatoes leaving the rye between these backset furrows. The rye, however, was allowed to make too strong a growth before being cut, so that it interfered seriously with the crops of corn and potatoes, though it unquestionably protected them from blown sand. This, together with the rather poor quality of the seed, doubtless reduced the yield of the potatoes considerably below what it might otherwise have been even on this extremely poor sand. The yields of potatoes, both small and large, on the plots, together with the fertilizer treatment applied this spring, are given in the following table:—

s I.—*Yields of potatoes in bushels per acre, and treatment of plots on sandy soil at Sparta in 1907.*

Treatment, pounds per acre.	Large potatoes.	Small potatoes.
Ground limestone, 700; phosphate, 200; potassium sulfate, 100	45.00	15.33
Phosphate, 200; potassium sulfate, 100	34.00	20.50
Blank	13.66	24.66
Ground limestone, 700	22.50	22.50
Peat, 50,000; potassium sulfate, 100; phosphate, 200	55.66	12.33
Manure, 30,000	90.83	16.33
Phosphate, 200	21.00	19.66
Blank	13.66	21.00
Phosphate, 200; ground limestone, 700	21.83	22.50
Potassium sulfate, 100; ground limestone, 700	40.33	22.83
Potassium sulfate, 100	33.83	22.33

rom the table it is seen that the manured plot stands first; to which peat with potash and phosphate were added, sec- potash, third; and calcium carbonate, fourth; while phos- e stands last, although even the phosphate had an appre- le influence on the yield over that of the plots without tment. Another field not included in this rotation and to ch additions of peat without potash and phosphate were e showed nearly the same yield as that of the plot to which sh and phosphate with peat had been applied. This, to- er with the influence of manure, indicates that the most ous need is that of nitrogen, and that there is very little efit to be derived from the use of the commercial fertilizers l a good supply of vegetable matter has been developed. he corn showed the same results but was frozen before reach- maturity and cut at once.

igure 52 shows the relative yield. That on the manured had reached the height of about five feet, while on the r plots it was very small, in some cases reaching a height nly two feet.

orth side of the field.—This side of the field, as above ed, was sub-divided into three plots, each in turn being ded into sub-plots for testing the most promising legumes. tilizer treatment was also applied to the entire field run- g at right angles to the long dimension of the cropped sub- s. The crimson clover made a fair growth on manured s, developing nodules. Ground limestone was beneficial.

lfalfa made a very poor growth, developing no nodules, and erefore showing practically no benefit from fertilizers. lsike clover made a fair growth on the manured portion of e sub-plot, but very poor growth on the remaining portions the field. Serradella made a fair growth where nodules deloped, which took place irregularly over the sub-plots. The ight reached during the season where nodules developed was out ten inches. Yellow lupines made a fair growth, reachg a height of about one foot where nodules developed, which ok place over about one-fourth of the area but quite irregurly. Cow peas developed nodules quite generally and made good growth. A slight effect of ground limestone was noticeble upon the cow pea plot where nodules developed.

As stated in the report for 1906, it is difficult to get legumes germinate well on this sand unless drilled, and, of course, npossible to prevent development of pigeon grass and other eeds. The serradella, yellow lupines, and cow peas on Secon E of this field were therefore sown in drills about twenty ches apart and this proved very helpful in keeping the field ean and promoting the growth.

It seems probable from these experiments that unless the elds are inoculated artificially, nodules do not develop on any of the legumes during the first year, and only to a mited extent the second year on this type of soil, so that it ill be necessary to reseed the same field three years before a ood growth of the legume can be expected. While this has een the general experience in other states, it was deemed lvisable at the initiation of these experiments to demonstrate on this soil in Wisconisn in particular, hence no effort was ade during the first year to artificially inoculate the soil. study, however, will be made of the practical methods of oculating this type of soil from fields on which they have een grown.

EXPERIMENTS AT IRON RIVER.

The general description of this field, together with the plan or the experiments, was given in the Annual Report for

1906, pages 188–191. The plot planted to corn and potat last year was sown to oats and clover in 1907. On acco of the extremely cold weather of the spring, followed by li rainfall in June, the yields were low. The oats were for hay on the 29th of July and the yields, together with treatment, are given in the following table:—

TABLE II.—*Yield and treatment of oat hay on sandy soil at I River, 1907.*

Plot.	Treatment, pounds per acre.	Yield acre pound
4	Check	80
5	Acid phosphate, 320	1,31
6	Peat, 20,000; rock phosphate, 600; potassium sulfate, 120	1,66
7	Manure, 20,000	1,82
8	Ground limestone, 600; sodium nitrate, 100	1,61
9	Check	1,01
10	Acid phosphate, 320; potassium sulfate, 120	71
11	Ground limestone, 600; potassium sulfate, 120; acid phosphate, 320	82

It is evident from this table that the element wh chiefly determines the yield is nitrogen, as all three of plots—6, 7, and 8—to which a fertilizer containing that ment was applied, have produced much more than the ot plots. The clover made an excellent catch on the portion the field on which corn was grown in 1906, but a very une catch on the portion which grew potatoes last year.

The field on which oats and clover were seeded in 19 and on which the clover failed to catch, was seeded this spr to oats and field peas to be used as hay as a substitute clover which was a failure. On account of the heavy wi storms and extremely light rainfall the yields were very l They are given in the following table:—

ABLE III.—*Yield and treatment of peas and oat hay on sandy soil at Iron River, 1907.*

ot.	Treatment, pounds per acre.	Yield per acre in pounds.
1	Potassium sulfate, 120	660
2	Potassium sulfate, 120; ground limestone, 600	764
3	Acid phosphate, 320; lime, 600	776
4	Check	680
5	Acid phosphate, 320	928
6	Peat, 20,000; potash, 120; rock phosphate, 600	920
7	Manure, 20,000	1,360
8	Sodium nitrate, 100; ground limestone, 600	1,304
9	Check	1,032
0	Acid phosphate, 320; potassium sulfate, 120	1,068
1	Ground limestone, 300; potassium sulfate, 120; acid phosphate, 320.	941

The field, which had been in leguminous crops in 1906, as planted in part to Wisconsin No. 8 dent corn and in rt to potatoes. Corn was injured seriously by sand storms June 9 and 16 so that it had to be replanted, which modid seriously the effects of fertilizer treatments. The yields e given in the following table:—

TABLE IV.—*Yield and treatment of corn on sandy soil at Iron River, 1907.*

ot.	Treatment, pounds per acre.	Yield per acre in bushels.
1	Potassium sulfate, 120	11.54
2	Potassium sulfate, 120; ground limestone, 600	28.71
3	Acid phosphate, 320; ground limestone, 600	30.24
4	Check	40.4
5	Acid phosphate, 320	25.44
6	Peat, 20,000; potassium sulfate, 120; rock phosphate, 600	26.03
7	Manure, 20,000	38.2
8	Sodium nitrate, 100; ground limestone, 600	26.3
9	Check	25.0
0	Acid phosphate, 320; potassium sulfate 120	26.56
1	Ground limestone, 600; potassium sulfate, 120; acid phosphate, 320	18.7

The other half of the plot was planted to potatoes, using e Aspinwall planter set at 9 inches. The variety was arman No. 3. The yields, together with the treatments, are ven in the following table:—

TABLE V.—*Yield and treatment of potatoes on sandy soil at Ir River, 1907.*

Plot.	Treatment, pounds per acre.	Yield per acre marketable potatoes.	Yield per acre small potatoes.	Total yield.
		Bu.	Bu.	Bu.
1	Potassium sulfate, 120	168.75	15.4	184.1
2	Ground limestone, 600; potassium sulfate, 120	203.86	16.9	220.7
3	Acid phosphate, 320; ground limestone, 600	198.8	16.25	215.0
4	Check	177.14	16.35	193.4
5	Acid phosphate	164.73	10.63	175.3
6	Peat, 20,000; rock phosphate, 600; potassium sulfate, 120	220.4	6.04	226.4
7	Barnyard manure, 20,000	247.5	5.04	252.5
8	Ground limestone, 600; sodium nitrate, 100	212.9	3.58	216.4
9	Check	184.37	5.04	189.4
10	Acid phosphate, 320: potassium sulfate, 120	203.5	7.9	211.4
11	Acid phosphate, 320; potassium sulfate, 120; ground limestone, 600	221.66	11.25	233.9

From this it will be seen that the yields, even on the u treated plots, are large. The manure has given the larg yields followed by acid phosphate, potash and ground lim stone, and the peat with rock phosphate and potash the lo est. There seems to be some indication that the ground lim stone has been beneficial, but apparently nitrogen is the e ment most needed by this soil at present. However, the fie was not a very uniform one and too much weight should n be given the variations in the yield.

Another field is devoted to leguminous crops for an i crease of soil nitrogen. Cow peas sown on uninoculated la made a fair growth, and developed nodules over a small p tion of the field this year—the second year on this groun The average height of the crop was about 10 inches. Cri son clover did not do well, the field becoming very weedy that it was necessary to reseed about the middle of Ju Nodules developed in abundance over the field but the clov did not make a very good growth. Hairy vetch sown t summer of 1906 produced an excellent stand in the fall that year so that the ground was completely covered. A p of the crop was killed by early spring frosts. The remai ing portion of the crop developed well during this season a blossomed abundantly. The yield was estimated at one a hird tons of hay per acre. It was left for seed, however, l was attacked by a variety of mildew. Fifty pounds of d were thrashed from one-fourth of an acre. Field peas n with rye developed nodules in the fall but were winter ed. Rye with peas were again sown this spring and it s necessary to cut the rye early to allow the peas to de-op. The growth of the peas, however, was only fair, al-ugh nodules were present on the roots.

Serradella sown the 31st of May developed a fair stand, hough the field was rather weedy. The nodules developed plants in patches over the field, and on these patches the nts made a heavy growth, attaining a height of ten to rteen inches, while the remainder of the field not develop- nodules had an average height of about 6 inches.

II. MARSH SOILS.

This is the fourth year during which field studies of the ility of marsh lands, especially of the peat in the northern t of the State, have been carried on. Reports on previous rs' work are found in the twenty-first, twenty-second, and nty-third annual reports.

EXPERIMENTS AT MARINETTE.

description of the soil of this field is given in the Twenty-t Annual Report, and results of experiments of the pre-ng three years in the Twenty-First, Twenty-Second, and nty-Third Annual Reports. This year the experiments planned to study the comparative value of farm manure, l ashes, and artificial fertilizers, each in varying amounts. field used was on virgin soil which had been broken in spring of 1906, and, lying without crop during the sum-, was again plowed in the fall of that year. This was ed in the spring of 1907 and prepared for crops. An of three and four-fifths acres was sub-divided into nine- one-fifth-acre plots for fertilizer tests. The fertilizers and the amounts applied are as given in tables showing the yields of barley and potatoes. The entire field was sub-divided at right angles to fertilizer plots into three tions so that a three-year rotation of crops might be foll One of these plots was sown to timothy and alsike which have developed a good stand but were not cut the ent year.

Although the spring opened early it became very cold so that the weather during May and June was excepti cold, which seriously interfered with the developme crops on this field.

Barley was sown at the rate of three bushels per a May 8. On August 6 a carful estimate of the crop o ley was made, although it was impossible to cut and the sections separately. The estimated yields, together the fertilizer treatments, are given in the following ta

TABLE VI.—*Estimated yield and the treatment of barley on soil at Marinette, 1907.*

Treatment, pounds per acre.	Esti yield i els p
Manure, 30,000	
Acid phosphate, 300; ashes, 2,000	
Manure, 20,000	
Manure, 10,000	
Ashes, 3,000	
Acid phosphate, 200; ashes, 2,000	
Acid phosphate, 100; ashes, 2,000	
Ashes, 2,000	
Acid phosphate, 200; potash, 50; lime, 800	
Acid phosphate, 300; potash, 50; lime, 1,600	
Acid phosphate, 400; potash, 50; lime, 2,400	
Ashes, 500	
Blank	

It will be seen from this table that, although manu plied at the rate of 15 loads to the acre gives slightly yields than the mineral fertilizers alone, a treatment phosphate supplementing wood ashes gives very nea large a yield. This would indicate that for this cro chief need of this soil is for the mineral elements, phos acid and potash. It must be remembered, however, th field had been in a fallow condition during part of th ceding year, so that nitrification was promoted and th was therefore probably more fertile that if it had been

the fall before seeding. It is also apparent from the
that the returns have increased steadily with the in-
in amount of application, and that where mineral fer-
s are to be used they should be applied in sufficient
its. Where good, unleached wood ashes are available
ire evidently of considerable value as a fertilizer on this
ut apparently need supplementing with a phosphate fer-
to secure the best results.

lf of the third field was planted to corn and the other
o potatoes. The corn, however, was completely frozen
ly so that no crop whatever was harvested. The pota-
lid exceptionally well on this soil from the start. On
of the plots the color was good and the yields, together
the treatments, are given in the following table:—

VII.—*Yield and treatment of potatoes on peat soil at Marinette in 1907.*

Treatment, pounds per acre.	Bushels per acre of salable potatoes.
lank.	88.
anure, 10,000	138.8
anure, 20,000	185.1
anure, 30,000	218.8
lank	86.0
shes, 1,000	110.0
shes, 2,000	138.0
shes, 3,000	160.0
shes, 2,000	146.6
shes, 2,000; acid phosphate, 100	168.0
shes, 2,000; acid phosphate, 200	158.0
shes, 2,000; acid phosphate, 300	196.6
ime, 800; potash, 50; phosphate 200	160.0
ime, 1,600; potash, 50; phosphate, 200	126.0
ime, 2,400; potash, 50; phosphate, 200	105.8
lank	66.6
otash, 50; acid phosphate, 200	128.0
otash, 50; acid phosphate, 300	120.0
otash, 50; acid phosphate, 400	164.0

will be seen from this table that farmyard manure has
the most effective fertilizer, and that the yield has in-
d steadily with the amount of manure applied. Five
per acre have produced an increase of 50 bushels, ten
arly 100 bushels, and fifteen of 130 bushels, so that for
irst ten loads applied the increase in yield has been
ximately 10 bushels per load per acre. The rate of in-

crease when fifteen are applied has fallen off somewhat. The potatoes this year were sold for about fifty cents per bushel, but assuming that their ordinary price would be about thirty cents a bushel, this would indicate a value on such land of three dollars per load for good farmyard manure. Wood ashes have effected a marked increase in yield, and here again the yields have increased steadily with the rate of application up to one and one-half tons per acre. The increased yield has been at the rate of about 50 bushels per ton of ashes applied. In this case therefore the ashes would, at ordinary prices for potatoes have a value of about fifteen dollars per ton when applied for this crop. The yields of potatoes, when ashes are supplemented with acid phosphate, have increased very greatly, though apparently not in direct proportion to the amount applied. A yield of nearly 200 bushels per acre was returned by the plot receiving one ton of ashes and 300 pounds of acid phosphate. Taking the average of the two blanks between which this plot stands, the fertilizers have given an increase in yield of 120 bushels per acre, or in money returns of about thirty-six dollars per acre, which, of course, is far in excess of the cost of the fertilizer. Where the two commercial fertilizers, sulphate of potash and acid phosphate, have been applied alone, the yields have been somewhat less than on the plots where ashes with phosphoric acid were applied. This portion of the field, however, is not quite so well drained as the remainder and this may have had some influence in reducing the yield. The cost of the fifty pounds of sulphate of potash and the 400 pounds of acid phosphate applied to Sub-plot 19 would be about $3.75 per acre, while they have caused an increase in yield of nearly 100 bushels per acre which would ordinarily have a value of $30.00. There has therefore actually been a financial gain from the application of this fertilizer of about $25 per acre.

In view of the influence of lime on the peat soils at Phillips in Price County, a test was made on this field at Marinette of the effect of lime in connection with phosphate and potash fertilizers. This is shown in Table VII on Sub-plots 13, 14.

15. It is evident, however, that the lime has had no
eficial influence and apparently has been detrimental.
reason for this detrimental effect, however, is not known.
t would appear from these experiments on potatoes that
crop is well adapted to this soil when well drained, and
manure, where available, is probably the best fertilizer,
ough where not readily available, wood ashes applied at
rate of about a ton per acre and supplemented with 300
nds of acid phosphate per acre, or 50 to 75 pounds of sul-
te of potash with 400 pounds of acid phosphate, can be
stituted for the manure. It is not intended to imply,
ever, that acid phosphate is the best form in which to ap-
the phosphoric acid. In all probability ground rock phos-
te will be much more desirable on this type of land under
inary field conditions. We have used the acid phosphate
experimental work simply in order to secure the most im-
liate effect of the treatment. The rock phosphate will un-
btedly be more economical in the long run, but does not
e so decided an indication of its benefit on the first crop.

EXPERIMENTS AT PHILLIPS.

s stated in the Twenty-Third Annual Report, page 193,
peat of the field at Phillips is very coarse and under-
l by clay. Work was done on this field in 1905 and 1906
described in the reports mentioned above. In view of the
ch greater influence of wood ashes over that of phosphate
l potash fertilizers alone, it was decided to study this in-
nce so as to determine, if possible, whether or not it was
chiefly to the lime content of the ashes. For this pur-
e a portion of the land adjoining that cropped last year
s cleared; the moss burned off during the summer of 1906
l it was plowed in the fall. This new land was then laid
in three fields and each field was sub-divided for the pur-
e of studying the effect of varying amounts of lime alone
l in connection with crushed and ground granite, rock phos-
ate, bone meal, acid phosphate, and sulphate of potash.
o of these fields were sown to barley and the third to

timothy and alsike clover. Lime was applied in the fall
1906 to the field on which timothy and alsike clover w
grown and to one of the fields on which barley was so
while on the other barley field the lime was applied in
spring of the present year. The application of the lime
at the rate of 10, 20, and 30 bushels per acre. The timo
and alsike clover were sown in the fall of 1906 and germ
ated well, making a good, even stand over the entire secti
This spring, however, there was a decided difference not
able between the plots having lime and those without li
Where no lime had been applied the grass had entirely d
out, while there was a good stand where lime had been
plied, though no difference was noticeable at first on the p
receiving different amounts of lime. The grass, howev
failed to make a good growth on any portion of the field,
no crop whatever was secured. On the field sown to bar
to which the lime had been applied in the fall of 1906,
barley made no growth on the unlimed portion, while it m
a fair start on the limed plots, but failed to develop well
that less than half a crop was secured even with heavy ap
cations of lime alone or supplemented with phosphate.
the field to which the lime was applied in the spring of
year, the barley did not start so well as on that limed in
fall of the preceding year. On this field timothy and als
clover were sown with the barley. The results as far as li
and phosphate treatments are concerned, however, were
same as those on the other barley plots.

It is evident from these results that there is some ot
difficulty with this land than its lack of available mine
elements or its acidity. It is possible that the cause of
fertility is due to a slow rate of nitrification, although it
not clear why the wood ashes should have so much m
marked effect than the lime when supplemented with b
potash and phosphate. This condition exists on large ar
of European peat soils and plans are now being made for
study of this matter on this field. It is evident that no
fluence of the ground granite as a fertilizer could be expec
under these conditions, nor could any study be made of

ve value of acid phosphate, bone meal, and untreated nd rock phosphate as a source of phosphoric acid.

Field II, described in the last annual report, part of shes were applied at the rate of one load per acre and at the rate of one-half load, while the third plot was without ashes. Barley was sown this year. The part e portion receiving the larger application of ashes was while that on the portion receiving one-half load of per acre was about sixty per cent of the full yield. No y whatever grew on the portion receiving no ashes. The on which grasses were grown in 1906 was broken and ed to potatoes this year. They sprouted well and grew e height of about four inches during June but were badly ed on July 2 and then were killed by frost on August 3, at the crop was an entire failure.

EXPERIMENTS AT MATHER.

stated in the Twenty-Third Annual Report, page 195, öperative experiment was begun in 1906 with Mr. A. Marvin at Mather on a field adjoining a ditch of the er Drainage District. This field was the only one at time sufficiently well drained to be available for experi al use, but is exceedingly irregular, so that it is not suit for experimental purposes, and another field has been ed and tile drained during the present year so as to be for experimental work during the coming season. The used last year was sub-divided into plots for fertilizer and into four fields for crops. On two of these fields y was sown on April 25 of this year as a nurse crop for hy and alsike clover. The barley germinated well but ontinued cold weather with severe snow storms injured arley to such an extent that it was plowed under early ne and the field resown to grass. The grass grew well g the season and there is now a good stand. A third was planted to corn, but was so seriously damaged by a all of six inches which occurred on July 3 that it would npossible to draw conclusions as to the effect of fertilizers on the yield. Potatoes, although badly damaged, n a fair growth later and averaged 156 bushels per acre though the stand was altogether too irregular to allow com son of the influence of the various fertilizers.

III. RED CLAY SOILS OF SUPERIOR REGION.

A brief description of the clay soils of the Superior re was given in the Twenty-Third Annual Report, page This year experiments on these soils have been along lines: first, the influence of drainage; second, stud methods of applying farmyard manure; and third, ferti tests.

EXPERIMENTS AT SUPERIOR.

A description of the field at Superior, which is sub-di for drainage studies, is to be found in the Twenty-Third nual Report, page 197, together with a statement of th fluence of drainage as shown in the crops of 1906. This the spring was dry so that the influence of drainage du the year was much less marked than the year previous. rainfall at Superior for May was 3.6 inches, for June inches, and for July 4.7 inches. As explained in the r above mentioned, the field is sub-divided into plots in w the tile are laid at 40, 60, and 80 feet apart, and the is sub-divided into lands running at right angles to plots for rotation of crops. The crops grown this year been first, barley, on the land planted to corn last second, cultivated crops—rutabagas, potatoes, corn, and s beets; and, third, clover.

The crops and yields grown on the plots having diff degrees of drainage are given in the following table:—

LE VIII.—*Yield per acre of crops on the tile drained and undrained red clay land at Superior in 1907.*

Distance apart of tile.	Barley.	Sugar beets.	Potatoes.	Corn.
	Bu.	Lbs.	Bu.	Lbs.
et	....	10,432	161	12,118
et	....	14,493	181	12,560
et	....	13,944	171	13,774
age	20.2	12,956	171	12,820
le	11.0	11,3.7	170	7,862

No determinations were made of the barley on the tile ired portions separately, but the yield for the three tile ined plots averaged over 20 bushels, while that on the unined portion was but 11 bushels. The low yield of sugar ts on the west end of the field, where the tile is 40 feet rt, was due to the poor stand caused by the hardness of ground. The variety of potatoes used was Carman No. planted June 6 in rows three feet apart, and fifteen inches rt in the row. The variety of corn used was a yellow t, planted May 30 in hills 3 by 3 feet apart.

On the whole it is evident that during this exceptionally year the effect of drainage which allowed the ground to ome warmer in the very early spring is important, although, of course, of very much less importance than last year en the rainfall was more normal.

Fertilizer tests.—In view of the fact that this heavy clay is ordinarily cold in the spring and not in a condition able to the decomposition of manure, an experiment was nned to compare the results of the application of barnyard nure as a top dressing with those when the manure is wed under. In view, further, of the fact that this soil has a high total phosphoric acid content and yet contains a ner high percentage of iron, which would tend to make the sphate unavailable, an experiment to determine the innce of phosphate fertilizer was included. These experints were made on barley, corn, and potatoes. The land all plowed in the fall of 1906, and the manure on that ch was applied at that time and plowed under was of a somet better quality than that available for use as a top dress-

ing in the spring of 1907. The yields and treatment
crops are given in the following table:—

TABLE IX.—*Yields and treatments of crops on fertilizer p*
clay at Superior in 1907.

Treatment.	Barley.	Corn.
	Bu. per acre.	Lbs. per acre
Barnyard manure, top dressing	23.5	12,151
Barnyard manure, plowed under	.....	11,010
Acid phosphate	28.0	.....
Blank	16.0	.....

From this it is seen that there is little difference i
of corn, while in the case of potatoes the plot on
manure was plowed under yielded better than whe
used as a top dressing. This may be due to the dif
the quality of the manure above mentioned, and th
must be studied further before conclusions can be dra
influence of phosphate fertilizer, however, is very m
indicates that this soil is not sufficiently supplied w
able phosphate.

EXPERIMENTS AT ASHLAND.

As stated in the Twenty-Third Annual Report, th
Ashland is one gently undulating so that portions
quite wet, while other portions have a fair surface
although the subsoil throughout is poorly drained.
was laid out in three portions in 1906, one part
drained, a second, of as near the same degree of d
possible, was left for comparison with the tile-drai
while the third, having the best surface drainage
was used for fertilizer tests. The tile were laid i
1906, and continued to deliver water during the fa
the ground on the drained portion was considerabl
the spring than on the undrained land. The crops
of the tiled and untiled land are given in the
table:—

ABLE X.—*Yields in bushels per acre on tiled and untiled red clay land at Ashland in 1907.*

Crop.	Untiled land.	Tiled land.	Difference.
arley	6.4	17.00	11.6
ats	7.88	19.23	11.42
orn	2.0 tons.	3.33 tons.	1.33 tons.
gar beets	2.55 tons.	6.42 tons	3.87 tons

From this table it is seen that the effect of tile drainage has
een very marked. The rainfall during the spring and early
ummer was extremely light, so that the effect must be attrib-
ted to the influence of the removal of the ground water dur-
ng the winter which allowed the ground to warm up much
nore quickly in the spring. The rainfall at Ashland for May
vas 3.95 inches, for June 0.9, for July 2.92 and for August
.96 inches. This drier condition of the ground in early
pring permitted the sowing of barley and oats about ten days
arlier than was possible on the untiled land. The corn and
ugar beets were planted at the same time on both portions of
he field, but the influence of the difference in degrees of drain-
ge and of temperature was very marked.

Figures 53 and 54 show the influence of tile drainage on the
tand of oats, showing clearly in Fig. 54, where land is untiled,
onsiderable areas which were so wet that seed did not ger-
ninate, while a fair stand is shown on the tiled field, repre-
ented in Fig. 53.

Figure 55 shows the yield of barley on equal areas of the
iled and untiled portion, the larger pile of sacks with the
iece of drain tile being the product of the drained field.

Fertilizer tests.—As stated above, the portion of the field
vhich had the best natural drainage was used for a fertilizer
est of the requirements of this soil. The field, however, is
ot entirely uniform, and this interferes somewhat with its
alue as a testing plot. The yields and treatments of the fer-
ilizer plots are given in the following table:—

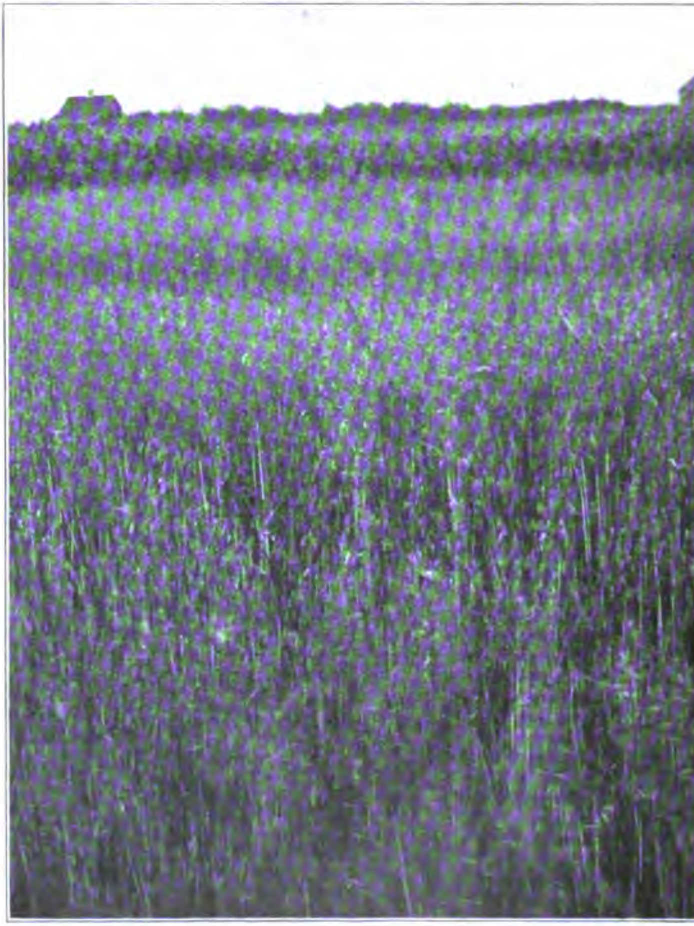

Fig. 53.—Oats growing on tile drained, heavy red clay at **Ashland in**

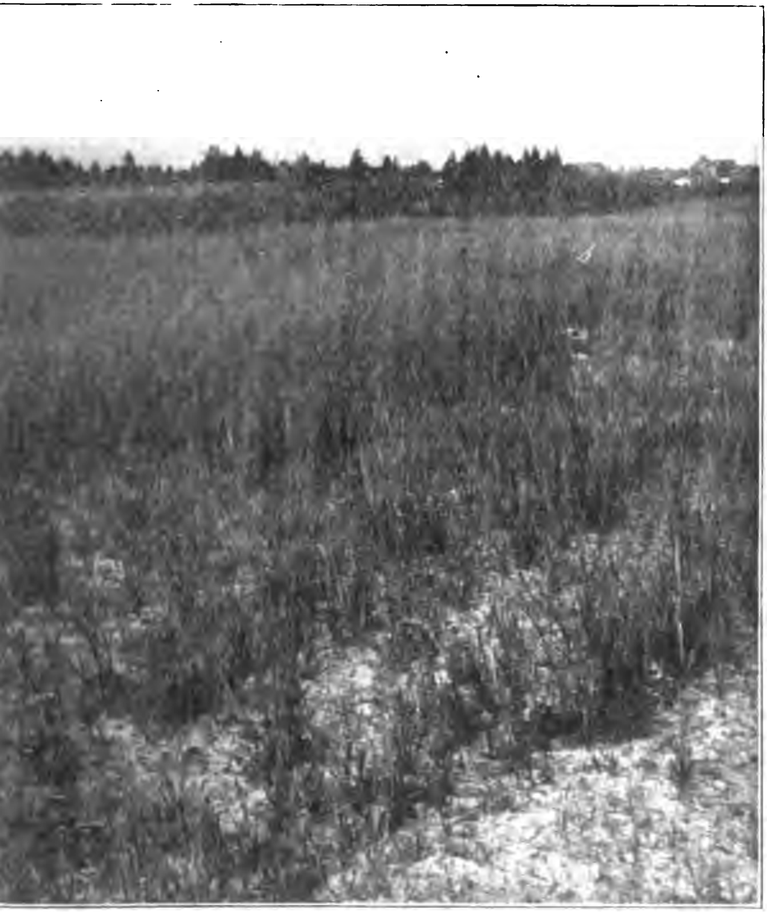

Fig. 54.—Oats growing on undrained, heavy red clay at Ashland in 1907.

TABLE XI.—*Fertilizer treatment and yields on red clay at Ashland in 1907.*

ot.	Treatment, pounds per acre.	YIELD PER ACRE OF DIFFERENT CROPS.			
		Barley.	Oats.	Corn.	Sugar beets.
		Bu.	Bu.	Lbs.	Lbs.
1	Barnyard manure, 20,000	14.6	10.25	6,786	7,268
2	Acid phosphate, 300	17.8	21.85	11,886	13,500
3	Blank	14.6	8.99	10,914	10,207
4	Sodium nitrate, 140; acid phosphate, 300	18.5	20.06	14,114	17,350
5	Blank	13.9	....	13,828	8,137
6	Sodium nitrate, 140; potassium sulfate, 140	18.0	32.56	20,114	18,240

The portion of the field on which barnyard manure was ap-
ied to the land producing corn and sugar beets was excep-
nally hard and devoid of humus so that the yields on that
rtion of the plot were not comparable with those on the
her plots. The portion of the field occupied by Plot 6 was
ore fertile naturally than the remainder, so that the yields
this case cannot be compared with those of the other plots.
ith the exception of this case, it is evident that the phos-
ate treatment has been very helpful. This is particularly
in the case of the cereals. It is also evident that nitrogen
lacking in available form and that the growing of clover
some other legume will be necessary to make the soil fertile.
he cause of lack of availability of phosphates is discussed in
e Twenty-Third Annual Report, page 171.

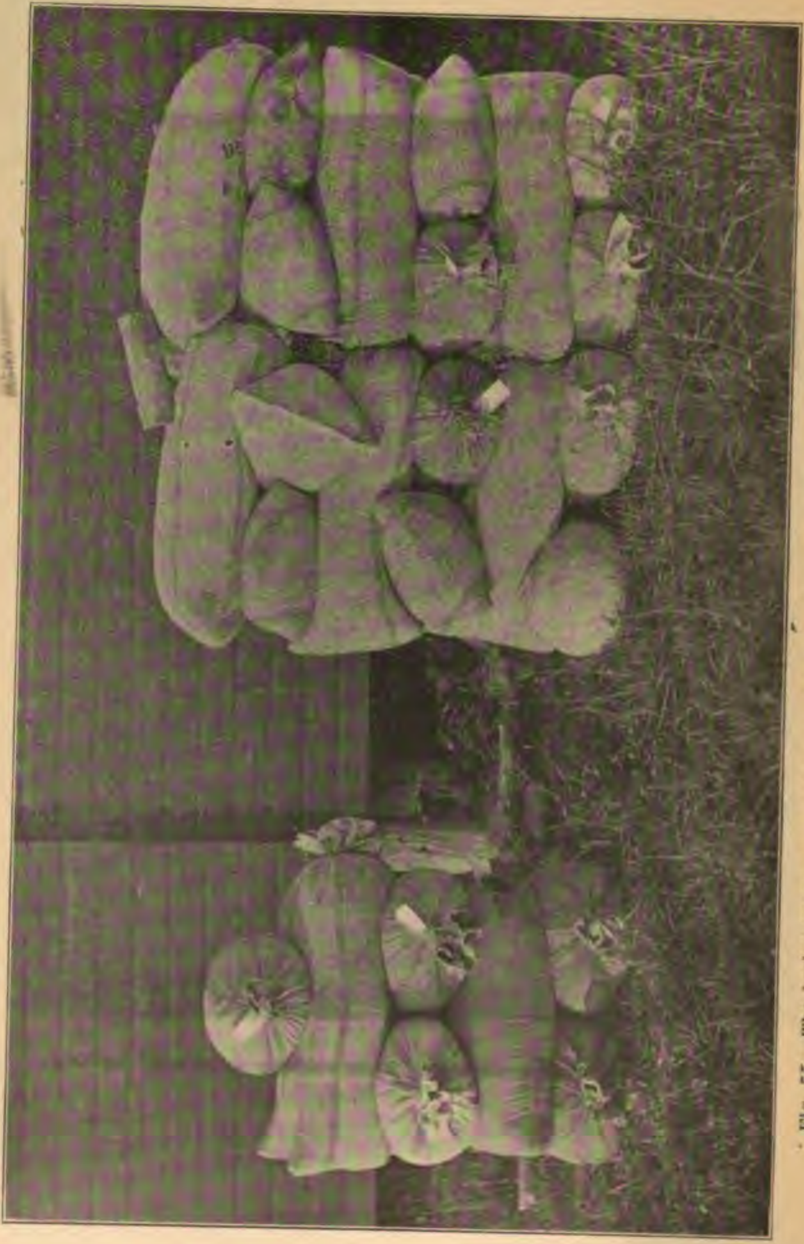

Fig. 55.—The barley grown on equal areas of tiled and untiled heavy red clay land at Ashland in 1907.

TABLE XI.—*Fertilizer treatment and yields on red clay at Ashland in 1907.*

Treatment, pounds per acre.	YIELD PER ACRE OF DIFFERENT CROPS.			
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Twenty-Third Annual Report, page 171.

DRAINAGE CONDITIONS IN WISCONSIN.*

A. R. WHITSON AND E. R. JONES.

Studies of the value of lands which can be reclaimed by drainage have been carried on by the Experiment Station during the past five or six years. In the fall of 1906 the Office of Experiment Stations of the United States Department of Agriculture aided the Experiment Station in making a survey of the amount of land in the State which could be benefited by drainage. The results of both of these lines of study are given in bulletin 146.

The lands which can be benefited by drainage are of two classes: first, the marsh lands, and, second, heavy clays ordinarily having fair surface drainage, but lacking sufficient underdrainage. There are at least two distinct types of marsh lands; first, those of the southern part of the State in the region covered by the last glacial ice sheet and underlaid by limestone to a large extent, and, second, those of the central and northern parts of the State which are usually raw peat underlaid by sand, or, on the area of granitic rocks, by clay. The first type of marsh soils is in general not acid and requires chiefly potash to enable it to produce good crops. Its large supply of nitrogen and phosphoric acid renders it highly fertile when properly drained and fertilized with a potash fertilizer or with barnyard manure. It is especially well adapted to corn, cabbage, rape, and other crops requiring large amounts of nitrogen. These lands will ordinarily require tile drainage to allow them to do well when cultivated, and when so drained these soils will be on the average as productive as the upland soils surrounding them, though not adapted to so large a number of crops.

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*A synopsis of Bulletin 146, giving results of studies on the drainage conditions of Wisconsin carried on by the Experiment Station in coöperation with the Office of Experiment Stations of the United States Department of Agriculture. This bulletin will be sent free to all requesting it.

The second class of marsh lands, occurring in the central and northern parts of the State, are acid and usually require both potash and phosphate fertilizers. When artificial fertilizers containing these elements or barnyard manures are added, good crops of the hay grasses, potatoes, barley, and some other crops can be grown. These lands are usually drained by open ditches, and the average expenditure for drainage is about $5.00 per acre. It is believed that where these peat soils are not too shallow their use for all of the crops above mentioned and with the treatment given will be fairly profitable.

The area of muck and peat marshes of the southeastern part of the State is approximately 600,000 acres and of the peat on the sand and granite area of the central and northern parts, about 2,000,000.

Although the benefit to be derived from draining the marsh lands undoubtedly will be great, the benefit from the drainage of wet clay lands will be much greater. The thorough drainage of these soils usually requires tiling, and it is estimated that there are approximately 4,750,000 acres of clay lands in the State which would be greatly benefited by tile drainage.

THE REQUIRED CAPACITY OF OPEN DRAINAGE DITCHES.

E. R. JONES.

In Wisconsin there are approximately three millions of acres of swamp land whose reclamation cannot be effected without the use of open ditches. Neither surface drainage nor outlets for lines of tile are afforded without these ditches. Their size and required capacity depend upon the maximum flood flow, which in turn depends upon a number of factors. Among these is the size of the catchment basin.

A study of the actual as well as the required capacity of drainage ditches in operation on areas of various sizes in the organized drainage districts of Juneau, Wood, Jackson, and Monroe counties was undertaken in the summer of 1906. Our resources for that year did not permit of having a man on the ground at each flood to observe the flow at the maximum. For this reason only irregular determinations were made. The outlet ditch of the Remington District, four feet deep and eighteen feet wide with a fall of three feet to the mile, was too small to remove the flood flow from 26,000 acres. A centrifugal pump is at work at present to make the ditch six feet deep. The main ditch of the Little Yellow District, six feet deep and thirty feet wide, is inadequate where the fall is only three feet to the mile, but when the fall per mile increases toward the outlet the entire flood flow from 50,000 acres is contained within the banks, the cross section of the ditch being the same in each case. The discharge near the outlet of this District during the maximum spring flood of 1906 was about 750 cubic feet per second, or at the rate of about one-third of an inch over the entire area in twenty-four hours.

During 1907 the relation of the run-off from different areas to the rainfall has been studied in detail. The conditions affecting the run-off are similar over this whole area, the marshes having a natural slope of from three to five feet to the mile. So-called sand islands, varying in size and aggregating an area about equal to that of the surrounding marsh, rise from two to five feet above the same. The marsh region is surrounded by gradually sloping sandy upland. This uniformity of conditions is essential when a comparison is made of the run-off from the areas varying only in size.

Five rain gauges of simple construction were placed at intervals over the area, where they were read by competent persons. The relation of the funnel to the bottle was such that an inch of rain produced three inches in the bottle whose sides were graduated to tenths accordingly. The duration of the rainfall, together with the amount, was included in the observations made in each case.

Seven stations, as described in the table, were selected at which to make run-off determinations.

TABLE I.—*Location and description of stations.*

Station.	Location.	Area in acres.	Size of ditch.	Fall in feet per mile	Maximum flood flow second-feet.
1	Main ditch of Little Yellow district at Cloverdale.	50,000	6x30	3	790
2	Lehman's bridge on the Beaver District ditch....	32,000	7x26	5	500
3	Wagon bridge on the Dandy Creek ditch at Wyeville..	35,000	8x38	5	280
4	Daniels' bridge on the Remington ditch	26.000	6x18	4	....
5	Wagon bridge one mile east of Valley Junction.	8,000	5x30	5	120
6	Wagon bridge in Valley Junction	8,000	5x24	5	100
7	East fork of Dandy Creek ditch at William Gray's farm	6 000	5x16	5	100

The size of the area drained was determined by adding to the known area of the marsh the estimated acreage sloping toward it. The Little Yellow and the Remington Districts are practically surrounded by other districts and hence they receive the run-off from only their own area. Nearly one-half of the 35,000 acres drained by the ditch at Wyeville is upland.

The side slopes of the ditches are 1:1. In some places the sides have fallen in, but the effective size is practically as given in the above tabular description. A statement of the fall per mile was obtained from the officials of the drainage districts.

THE COLLECTION OF DATA.

The velocity taken at 0.6 of the total depth was assumed to be the average velocity for an area extending two feet on each side of the point at which the current meter was held. The discharge was thus found for each section four feet wide, and these combined give the total discharge of the stream. Discharge determinations were made at each station from two to five times during the spring and summer when the water was at different stages. An effort was made to determine each flood flow as soon as possible after it reached its maximum height. From this data a rating curve was plotted showing the discharge at any stage between the maximum and minimum at which the discharge was actually determined.

TABLE II.—*Discharge determinations at Cloverdale.*

Date.	Stage.	Discharge in second-feet.
March 27	2.7	130
April 18	2.4	110
May 27	3.1	175
July 24	6.0	790

The water stage was read from a stationary gauge at each station by competent persons living near. During April the stage was read daily, but later it was read only at flood flow. Readings were sometimes taken every two hours when the water was rising fast as the result of rain. In each case the observer was asked to note the average low water stage during the summer months. The following observations taken at the Little Yellow ditch at Cloverdale illustrate the method and nature of those taken at all stations. The discharge determination of April 18 was made by Mr. R. R. Marshall, and the remainder by the writer. The stage of the water at this station was read by Mr. Max Allenfort whenever it was thought that it had been influenced by a fall of rain. The rain gauge was also read by Mr. Allenfort.

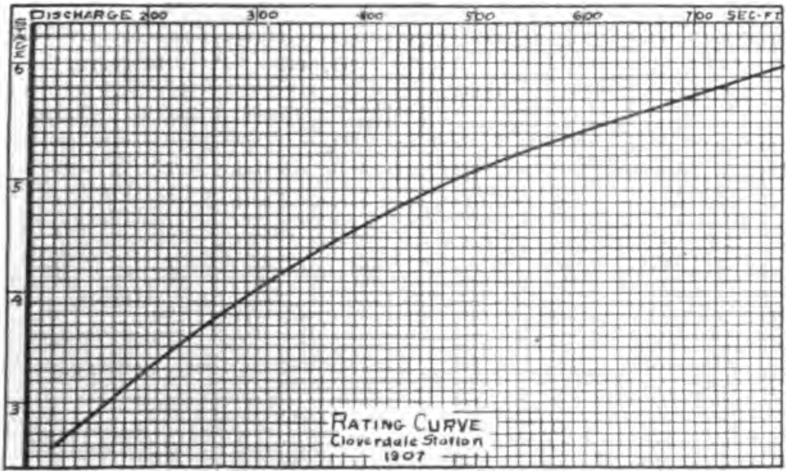

Fig. 56.—An example of a rating curve from which the discharge of the stream at any stage may be found.

It will be noticed that the rating curve covers no discharges where the stage is less than 2.4, and hence no discharges were estimated at stages lower than that. This omission is justified for reasons given later.

DISCUSSION OF RESULTS.

It is the maximum flood flow that determines the required capacity of a drainage ditch. A ditch which will carry this maximum without damage to crops will of course take care of the smaller floods. A record of the normal flow or the smaller floods is of value only to aid in determining which flood really was the maximum. During the period covered by the observations, the flood caused by the rain of July 21 was the greatest. On that date the official United States weather records of precipitation showed that there was a uniform rainfall of four and a half to five inches over the entire area except the Remington District which had a smaller precipitation and is eliminated from comparison. The flood flow at that time is given with the tabular description of the stations. It amounts to nearly the rate of four-tenths of an inch from the entire catchment basin in twenty-four hours in each case. It was expected that the amount of water, expressed in

TABLE III.—*Daily discharge at Cloverdale.*

Date.	Hour.	Stage.	RUN-OFF.		RAINFALL.	
			Second-feet.	Inches.	Inches.	Hours.
May 7	2 P. M.	2.3	......	......	0.3	10
7	4 P. M.	2.3	......	......	......	......
14	5 A. M.	2.2	......	......	0.8	8
14	7 A. M.	2.3	......	......	......	......
17	6 A. M.	2.4	110	.05	0.2	4
17	7 A. M.	2.0	......	......	......	......
22	12 M.	2.5	115	.055	1.1	5
25	12 M.	2.8	143	.067	0.6	12
27	12 M.	3.1	175	.083	......	......
June 3	6 A. M.	1.9	......	......	0.4	8
3	3 P. M.	2.1	......	......	......	......
10	6 A. M.	1.8	......	......	1.6	8
10	6 P. M.	2.3	......	......	......	......
21	11 A. M.	1.1	......	......	0.2	6
21	5 P. M.	1.4	......	......	......	......
22	7 A. M.	1.4	......	......	0.5	1
22	5 P. M.	1.6	......	......	......	......
30	12 M.	1.7	......	......	0.7	2
July 2	7 A. M.	1.6	......	......	0.6	3
2	6 P. M.	1.8	......	......	......	......
4	8 A. M.	1.5	......	......	4.8	7
4	6 P. M.	5.5	625	.30	......	......
11	4 P. M.	2.8	143	.067	0.5	2
11	6 P. M.	3.0	165	.078	......	......
15	5 A. M.	2.3	......	......	1.0	6
15	10 A. M.	2.6	123	.056	......	......
21	6 A. M.	1.2	......	......	4.4	13
21	6 P. M.	4.2	310	.145	......	......
24	8 A. M.	6.0	790	.38	......	......

inches, removed from the different areas would increase as the area decreased, but such was not the case. A marked difference, however, was noticed in the time at which the flood was at the maximum at the different stations. At Gray's the high water mark was reached on the night following the rain. At Wyeville, six miles farther down, the maximum was not reached until thirty-six hours later, and at Cloverdale it was not reached until forty-eight hours after the rain had ceased.

The dimensions that a ditch must have to give it the required capacity can be approximated at least by a study of the tabular description given of the ditches. The Little Yellow ditch was not large enough. The Beaver ditch might perhaps have carried one-third more water than it did, and the Dandy Creek ditch at Wyeville might have carried a half more without overflowing. Omitting the Remington ditch, the other three might have carried twice as much water.

It is interesting to note that the first ditches made tend to fall below the required capacity, while those of recent construction exceed it. Experience has taught those interested to make larger and deeper ditches than those formerly planned. It is equally interesting to note that although the rainfall of July 4 was equal to or greater than that of July 21, the run-off was not so great. The reason is that at the time of the first heavy rainfall the peat marshes were dry and a large part of the rain water was absorbed. This supports the contention that good drainage actually decreases the run-off from heavy rains and goes to show that the ditches in operation in Central Wisconsin are a success.

SOME FIELD STUDIES IN TILE DRAINAGE.

E. R. JONES AND W. C. SCHROEDER.

In view of the movement of the Middle West toward tile drainage, it seems desirable to ascertain as nearly as possible the results of the methods and standards that have been followed in the past for systems now in operation. The extent to which tile drainage should be carried depends upon the success which, in actual practice, has attended similar projects under similar conditions. This includes a study of the profit realized on the investment in tile and involves a consideration of the frequency, depth, and size of tile which has proven most economical. Information bearing on these points can only be obtained from field observations.

THE COLLECTION OF DATA.

The area selected for study was in Milwaukee and Racine counties where tile drainage has reached a stage of advancement equaled perhaps by no other section of Wisconsin. No attempt was made to ascertain the ratio of the amount of land still undrained to that already drained. Such a study was made on a whole township near Racine last year and the results were published on page 34 of Bulletin 146 of this Station. Each farm from which data were taken was visited and the farmer was asked a set of questions concerning the tile laid on his farm. This was supplemented by a general statement from him as to mistakes that had been made and as to possible improvements.

Comparisons were made between the crops growing on the
e drained land and on similar undrained areas. The record
the crops has been made in percentage of a perfect crop,
at the rate of 40 bushels of barley, 50 bushels of oats, 200
shels of potatoes or three tons of tame hay to the acre.

It seems advisable to divide the tile drained areas into
ree classes on the basis of the kind of system by which each
drained. A gridiron system is one whose laterals are par-
lel, of uniform frequency and usually at right angles to the
ain into which they discharge. Such systems are employed
flat marsh areas. On land slightly rolling, with wet de-
essions, we find single lines of tile where needed. Two or
ore of these laterals may join a larger main as branches
in the trunk of a tree, and we have what is known as a
atural system. Between these two types, resembling each in
me respects, we have what may be termed a combination
stem.

TABLE I.—*Tabulated data collected in the field.*

	Plot.	Per cent of crop.		Owner.	Acres.	Amo'nt of tile.	Size.	Depth.	Frequency.	Slope.	Soil.	Subsoil.
		Before.	After.									
						Rods.	In.	Ft.	Rods apart.			
	IV	30	150	J. De Young....	51	5 1,585 220 5	5 3 2.5 4	2.5	4	2.5 feet in 8 rods	Black loam.	Sand.
	V	50	75	H. Winger........	12	102 210	4 3	3.5	4	2.5 feet in 40 rods	Black loam.	Clay.
	VI	40	80	C. H. Klevenow.	14	25 30 420	6 5 3	3.0	3	2.5 feet in 40 rods.	Black and little sand.	Blue clay or gravel.
	VII	75	85	John Ferries.	35	70 490	4 3	3.0	3	3 feet in 40 rods.	Black loam.	Blue clay.
	VIII	40	95	M. Rasmusson..	95	123 20 20 20 3,800	12 10 6 5 3	2.5 3.5	4	2 feet in 1 mile.	Black loam.	Gravel, some blue clay.
Gridiron	IX	5	90	H. E Judd	50	25 20 20 20 20 45 1,435	12 10 8 6 5 4 3	4.0 3.5 3.0	4	2 feet in 110 rods	Muck.	Black muck to about 10 feet.

	XXV	15	95	N. R. Rowe......	25	50 855	6 3	3 to 3.5	4 and 2		Peat.	Peat, 4-10 feet.
	XXVI	40	80	Mrs. Smith......	14	30 435	6 3	3.0	4	4 feet in 90 rods.	Black gravel loam	gravelly clay.
	XXVII	50	85	Mr. Swartz......	20	15 40 270	8 6 3	3.0 to 4.0	6	4 feet in 80 rods.	Black clay loam.	Blue clay.
Natural.....	XIV	50	90	J. S. Meade......	10	95 235	6 3	2.0 to 3		Not known but large.	Black sandy loam.	Red clay.
	XV	20	90	A. Basse.........	1.5	110	3	2.5 to 3			Black loam	Blue clay.
	XVI	75	95	N. Trimborne....	15	275	3	3.0		17 feet in 80 rods.	Black loam.	Clay.
	XIX	75	100	A. P. Nelson.....	28	125 470	6 3	3.0 to 4.0		9 feet in 75 rods.	Black loam.	Blue clay.
	XX	50	95	C. Gabrielson....	25	15 80 20 375	7 6 5 3	3.0 to 3.5		15 feet in 80 rods.	Black loam.	Sand and clay.
	XXII	60	100	T. C. Roberts....	30	60 55 90 270	6 4 2.5 3	2.75 to 3.5			Black sandy.	Red clay.
	XXI	50	85	Nels Matson.....	40	40 90 385	5 4 3	2.75 to 3		8 feet in 80 rods.	Sandy loam.	Clay with a little sand.
	XXIII	55	95	E. Ball...........	20	40 60 60 320	6 5 4 3	3.0 to 3.5		5 feet in 20 rods.	Black clay loam.	Blue clay.
	XXIV	0	105	G. Ela........ ..	1.5	25 35	5 3	3.0 to 4.0		3 feet in 25 rods.	black sandy loam.	Blue clay.
	XXVIII	65	90	J. F. Bishop....	15	75 140 185	5 4 3	3.0 to 3.5			Black sandy loam.	Reddish clay.

TABLE I.—*Tabulated data collected in the field*—Continued.

	Plot.	PER CENT OF CROP.		Owner.	Acres.	Amo'nt of tile.	Size.	Depth.	Frequency.	Slope.	Soil.	Subsoil.
		Before.	After.			Rods.	In.	Ft.	Rods apart			
Combination	I	45	75	E. S. Robbins...	30	60 20 45 355	6 5 4 3	3	4	4 feet in 70 rods. 4 feet in 95 rods.	Black muck, little clay.	Mostly blue clay.
	II	30	75	Wm. Vogel	15	35 45 460	5 4 3	3	4	4.5 feet in 35 rods.	Black loam.	Blue clay.
	III	65	95	N. E. Fisher.....	28	48 55 290	6 4 3	3 to 5.5	4	5 feet in 80 rods.	Black loam.	Blue or yellow clay.
	X	20	100	N. R. Purvis....	45	120 15 75 1,170	8 7 6 3	3	4	4 feet in 100 rods.	Muck.	Muck, 2-5 feet deep.
	XII	45	95	E. Martin........	9	60 215	6 3	2.5		8 feet in 60 rods.	Black clay loam.	Gravelly clay.

COST AND BENEFIT.

Higher wages and increased cost of tile have made tile rainage more expensive than formerly. However, it is the resent cost with which we must reckon and that given n the following table is based on present prices. To sim- lify matters it has been assumed that four inches is the verage diameter of tile in use. A great deal of larger ile has been laid, but since more than three-fourths of the otal is three-inch tile, four inches is a fair average. The otal cost of the tile and the laying was figured at seventy-five ents per rod.

TABLE II.—*Cost and benefits of tile drainage.*

System.	Plot No.	Acres in plot.	Increase in crop.	Cost of tile.	Per cent of cost recovered in one year.
ridiron..........	IV	51	$1,224 00	$1,331 25	89.8
	V	12	60 00	294 00	20.4
	VI	14	112 00	356 25	31.4
	VII	35	70 00	420 00	16.5
	VIII	95	1,045 00	2,987 25	34.9
	IX	50	850 00	1.188 75	71.5
	XI	25	400 00	690 00	57.9
	XIII	30	600 00	908 25	66.4
	XVII	4	36 00	93 75	34.4
	XVIII	2	18 00	93 75	19.2
	XXV	25	400 00	678 75	58.9
	XXVI	14	112 00	384 75	32.1
	XXVII	20	140 00	243 75	57.4
atural.........	XIV	10	80 00	247 50	32.8
	XV	1.5	21 00	82 50	25.4
	XVI	15	60 00	206 25	29.0
	XIX	28	140 00	446 25	31.3
	XX	25	225 00	367 50	61.2
	XXI	40	280 00	386 25	72.4
	XXII	30	240 00	356 25	67.3
	XXIII	20	160 00	360 00	44.4
	XXIV	1.25	26 25	45 00	58.0
	XXVIII	15	75 00	300 00	25.0
ombination....	I	30	180 00	360 00	50.0
	II	15	135 00	405 00	33.3
	III	28	168 00	294 75	56.9
	X	45	630 00	1,050 00	60.0
	XII	9	90 00	206 25	43.6

SIZE OF MAINS.

In regard to the size of main required for different areas, little of special value was gathered or observed except that no outlet described in Table III was taxed to its full capacity. In the majority of cases less than half the carrying capacity was reached, and that only under extraordinary conditions. From this it seems safe to conclude that instances will be rare indeed where outlets will be required larger than those observed. This view is made more plausible by the fact that some of the areas included in the study had been springy in character.

TABLE III.—*Size of mains.*

System.	Plot No.	Size.	Rods of tile in system.	Acres.	Fall.
		In.			
Gridiron	V	4	106	4	2.5 feet in 40 rods.
	VI	6	195	4.5	2.5 feet in 40 rods.
	VII	4	420	30	2.5 feet in 40 rods.
	VIII	12	3,983	95	1 foot in 1 mile.
	IX	12	1,585	50	2 feet in 10 rods.
	XI	8	920	25	6 feet in 80 rods.
	XXVI	6	465	14	4 feet in 90 rods.
	XXVII	8	325	20	4 feet in 80 rods.
Natural	XIV	6	330	10	5 feet in 40 rods.
	XIX	6	595	28	9 feet in 75 rods.
	XX	7	490	25	15 feet in 88 rods.
	XXI	5	515	40	8 feet in 80 rods.
	XXII	6	485	30	4 feet in 60 rods.
	XXIII	6	480	20	5 feet in 20 rods.
Combination	III	6	393	28	15 feet in 80 rods.
	X	8 & 6	1,400	45	15 feet in 100 rods.
	XII	6	275	9	8 feet in 60 rods.

DEPTH AND FREQUENCY.

No attempt was made at a systematic study of the relation between the depth and frequency of the tile drains. However, some general observations were made. On Plot XVII better results would have been obtained if the tile were nearer together than six rods. The color and yield of the cabbage crop it was producing was noticeably better on a strip about two rods wide, directly over the tile. On Plot I Mr. Robbin contemplates putting in a lateral between each two already in, thus making them two rods apart. The land is under intensive cultivation and the improvement is perhaps warranted. Only in these two cases was it apparent that the lines of tile should be more frequent. On Plot XIII, drains six rods apart were particularly efficient. This is due partly to the sandy subsoil and partly to the depth at which the tile were laid. It bears out the underlying principle of the relation of the depth to frequency; the deeper the tile, the less frequent they have to be.' The matter of quick drainage, however, is quite another problem.

DURATION OF TILE.

The tile systems observed had generally been laid piecemeal for the last twenty years, so that it can not be correctly said that any one particular system has been laid for a definite length of time. It was the common experience of farmers, however, to find that the efficiency of the tile increased permanently after the first year. On the 717 acres observed there was but one small field upon which tile, once laid, had to be taken up. This field was one of muck where the tile were laid only about a foot and a half deep, so shallow that the action of the frost heaved them still nearer the surface. The fault was in the laying rather than in any inherent tendency of tile, properly laid, to become less efficient with reasonable age.

CRANBERRY INVESTIGATIONS.

A. R. WHITSON AND O. G. MALDE.

The season of 1907 cannot be considered an altogether successful one from the growers' standpoint. The total crop has not been much over one-half the normal. The great majority of the bogs came through the winter in good condition and had a good setting of buds, as shown by an examination during the last week of May. The blossoms opened well, but in the Mather region were seriously damaged by the heavy rains of July 3, 4, and 5. The "False Blossom" also greatly reduced the yield in that region, while in the Cranmoor and Berlin districts, insects and blight caused a reduction in yield. The injury from fungous diseases was small. Damage from frost was also of small amount owing to the excellent and timely predictions of the Weather Bureau. During the latter part of the season the water supply on many of the bogs was deficient and there was some loss by frost on this account.

The season opened about two weeks later than usual and has been late throughout. The harvest was about a week later than usual and the fruit much less mature than at opening of harvest last year. The indications at present are favorable for next season's crop. Although the budding during the harvest period was slow it developed well later in the season.

IRRIGATION AND DRAINAGE.

Influence of drainage, sanding, and weeding on soil temperature.—The studies on the influence of local conditions of drainage, sanding, and weeding on soil temperatures were begun three years ago and have been continued this season. Determinations of soil temperatures at three and six inches below the surface, and at two inches, three feet and two inches, and at forty-five feet above the surface were taken twice daily beginning May 1, except during some periods when the determinations were made every two hours for a period of fifty to sixty hours to determine the exact time of the maximum and minimum of the different soil plots at different periods of the season and especially with reference to the rate of temperature changes on cold nights following clear, warm days. One additional station was used the present year. The data collected in this way would occupy more space than is available in this report, and will be given in detail in a bulletin to be published in the near future. The general results of this season's operations are the same as those of preceding years and emphasize the influence of drainage and sanding on soil temperature. No flooding on the Station bog was found necessary between April 11 and September 21 this season, while frost occurred in every month on other bogs.

Depth of drainage.—The studies on the influence of deep, shallow, and no drainage on the yield of berries have now been continued four years and the results are given in the following table:—

TABLE I.—*The yield of cranberries in barrels per acre on drained and undrained plots on section F.*

Year.	Plot 6. Drained 14 inches.	Plot 7 Drained 4-8 inches.	Plot 8. Water held at surface.
1904	50	53	52
1905	35	27	24
1906	37	41	35
1907	34	32	19
Average	39	38	32

The results indicate a considerable benefit from drainage. The importance of drainage will, however, vary with the character of the subsoil. In this case the peat is comparatively shallow, usually not exceeding 12 inches in depth, below which is a layer of sandy muck underlaid by sand.

Where the peat is as deep as it is on many bogs the influence of drainage would probably be greater than that indicated in the above table.

These plots were pruned in November of this year, Plot 5 yielding at the rate of 1,700 pounds per acre, Plot 7, 1,540 pounds per acre, and Plot 6, 1,360 pounds per acre. It was found at this time that the roots on the better drained plots showed a tendency to extend deeper and they were stronger than those on the undrained plot. After the pruning, all of the plots appeared to have about the same amount of vines. These plots will receive a light sanding of one-half inch during the coming winter, and the observations on the influence of depth of drainage will be continued.

SOILS AND FERTILIZERS.

Sanding.—Plots Nos. 4 and 5 of Section F were sanded to a depth of two inches in March of 1905, but owing to other experiments on the ground no accurate yield of berries was obtained on Plot 4. Plot 5 yielded at the rate of 44 barrels per acre in 1905 and 51 barrels in 1906. In 1907 Plot 5 yielded at the rate of 24.6 barrels per acre, while Plot 4 yielded at the rate of 47.3 barrels per acre. The vines on Plot 5 did not blossom so well this year and were affected more by blight than those on Plot 4, which was also somewhat more heavily vined. It is evident that the application of two inches of sand at one time on vines already established is very detrimental, covering as it does the runners in such a way as to prevent rapid development of more runners.

The application of half an inch, or thereabouts, of sand to ground already well covered is found to be beneficial, and the results on the above experiment should not be compared with the results where vines are planted on land after it has been heavily sanded. This matter will be mentioned later.

Fertilizers.—Fertilizer tests on eight plots on the Experiment Station ground have now been continued four years, the results of which are given in the following table:—

TABLE II.—*Yields of cranberries on fertilized plots, 1904-1907, inclusive.*

Treatment.	Yield, bushels per acre.				Average.	
	1904.	1905.	1906.	1907.	4 years.	Last 3 years.
Sulphate of potash	73	27	52	39	48	39
Sodium nitrate	64	24	43	73	51	47
Acid phosphate	60	31	40	60	48	44
None	33	25	32	53	36	37
Potash and nitrate	53	59	52	60	56	57
Potash and phosphate	47	55	48	38	47	44
Nitrate and phosphate	113	72	76	52	78	67
None	84	36	42	44	52	41

Inasmuch as the full effect of the fertilizers would not be reached the first year, it is believed that more accurate determinations of the relative influence of the different fertilizers are obtained by the average of the yields of the last three years as given in the last column of the above table. From these figures it is evident that the treatments which have been most beneficial are, first, phosphate and nitrate in combination, and, second, potash and nitrate.

The last two years two coöperative tests with growers have been made—one on the bog of Mr. S. N. Whittlesey, and the other on the bog of Mr. A. E. Bennett. In both cases the experiment consisted of an application of acid phosphate, sodium nitrate, and potassium sulphate, each alone and each in a combination of two on areas of one-tenth acre, except that for lack of area, the potash and nitrate were not used singly on Mr. Bennett's bog. This application was made in the spring of 1906. No effect was noticeable that season, but in the spring of 1907 the fertilizers had an evident effect on the vigor and growth of vines, the greatest difference being caused by the phosphate and potash both alone and in combination on the Whittlesey bog, and potash and nitrate and nitrate and phosphate on the Bennett bog. The yield of berries together with the treatments are given in the following table;—

TABLE III.—*Yield in barrels per acre on fertilized test plots on the bogs of Mr. S. N. Whittlesey, and Mr. A. E. Bennett, 1907.*

Treatment.	YIELD, BARRELS PER ACRE.	
	Whittlesey.	Bennett.
Sulphate of potash	90	....
Sodium nitrate	78	....
Acid phosphate	101	33
Potash and nitrate	86	41
Potash and phosphate	79	18
Nitrate and phosphate	75	41
No treatment (average of two plots)	71	38

The results on the Bennett bog, however, were different from those on the Whittlesey bog. While the vines on Mr. Whittlesey's bog grew vigorously in the early summer on the treated plots, the uprights did not grow exceptionally long and the fruiting was good. On Mr. Bennett's bog, however, the nitrate fertilizers had the effect of stimulating the growth of the vines, so that the vegetative growth was probably too much to allow of the best fruiting and the yields were less in proportion to the vigor of the vine growth on the treated plots than on those not treated. The uprights on these treated plots had grown from four to nine inches, while on the plots without treatment they were but from one to four inches in length. It is possible that the yields on the plots receiving nitrate fertilizers may be larger next year, so that conclusions as to the benefit of fertilizers on these plots cannot be drawn at present.

The plot on which phosphate and potash were applied on the Bennett bog had more moss than the remainder of the area and this may, in part at least, explain the low yield on this plot. The condition of moisture may also have influenced these results. Mr. Whittlesey's bog was considerably drier throughout the season than that of Mr. Bennett. Further study of the fertilizer requirements and of the time of application is necessary.

CULTURAL METHODS.

Methods of planting.—A number of plots planted on the Station in 1904 produced fruit this year, and gave some indication of the results of different methods of planting, and to some extent of the comparative value of a few of the standard varieties of berries. One plot was planted in 1904 with native vines, which yielded this year at the rate of ten barrels per acre. A second plot was planted with Palmeters which yielded seventeen barrels per acre, and a third with Howe which yielded twelve barrels per acre. All three of these plots were set with short cuttings by the use of the disc, as described in Bulletin 119, pages 28–30. Another plot was planted with vines from Nursery Plot No. 80 in June, 1905, and yielded this year at the rate of twenty-six barrels per acre. These vines were set with a dibber in rows about five inches apart and the vines one to two inches apart in the row. All of these vines were on bog which had been sanded to a depth of about two and one-half inches. McFarland vines, which were planted in 1904 on unsanded peat, yielded about one barrel to the acre. The method of planting was the same as that of the Palmeters and Howes, above mentioned.

During the last week of May all desirable vines on the old nursery were removed to the Experiment Station nursery and the old nursery was abandoned.

It will be the policy of the Station in the future to devote more effort than heretofore toward propagating vines that display desirable qualities.

Moss killing tests.—Mr. A. E. Bennett applied air slaked lime to a portion of his bog in 1904 with the idea that it would be beneficial as a fertilizer. Examining the bog later he found that the sphagnum moss on the treated area had turned brown and later a considerable part was found to be dead. This led Mr. Bennett to use lime for the purpose of killing the sphagnum moss on the remainder of his bog. It was found that the lime when properly applied had no injurious effect on the vines. Further tests were made by the Station and by other growers, as reported in the annual reports of the last two years. As a result of these experiments we would recommend the application of two barrels of air slaked lime to the acre to be applied late in May. The application can be repeated the second year, but it would probably not be well to make a third application till after at least one year had elapsed. Fig. 57 shows the form of lime spreader used the past season, designed by Mr. Bennett.

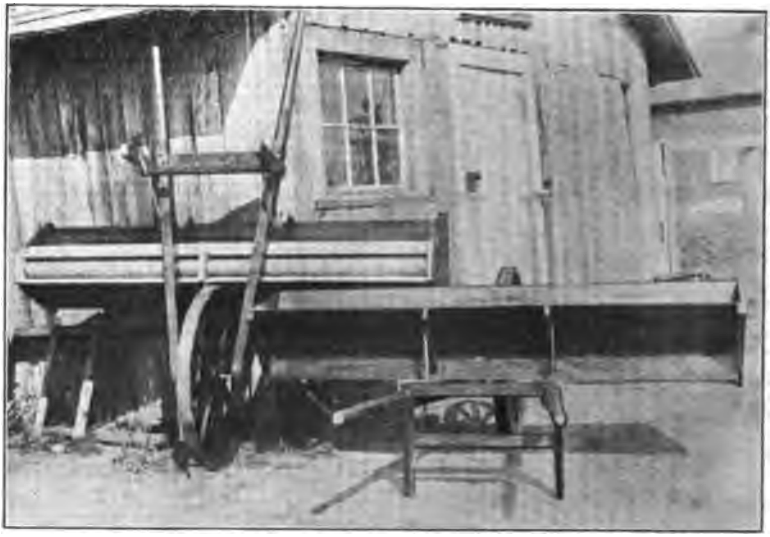

Fig. 57.—Wheel barrow apparatus used in applying lime on cranberry bog.

Wood moss is not killed by the lime, which is effective on sphagnum moss. Experiments were, therefore, undertaken to discover some treatments which would be effective on the wood moss. The first application was that of dry salt, which, however, was difficult to distribute evenly and in such amounts as would be necessary to affect the moss without injury to the cranberry vines. This year a test was made by applying the salt in solution, which yielded excellent results. The application of a mixture of fifteen pounds of common salt to fifty gallons of water at the rate of four barrels to the acre just before the opening of the terminal buds of the cranberry vines has been found safe and effective for killing the wood moss, which at that time grows rapidly. In the latter part of September a second growth of moss is usually noticeable and can be killed by a second application of salt at that time. Where the areas to be treated are small, a bucket pump spray can be used effectively; for larger areas a standard brass cylinder barrel pump spray apparatus would be preferable.

REPORT ON THE STUDY OF INSECTS INJURIOUS TO CRANBERRIES DURING THE SUMMER OF 1907.

C. B. HARDENBERG AND O. G. MALDE.

THE THREE MOST INJURIOUS INSECTS.

As heretofore, the three most injurious insects have been black and yellow-headed vine-worms and the fruit-worm. Considerable information concerning the life histories of these three insects has been gathered.

Owing to the lateness of the season this year, the dates on which the insects made their appearance were much later than usual, the difference ranging from ten days to two weeks.

The injury done by the *black-headed vine-worm** has been considerable, both in the region around Cranmoor and in the Berlin district. The first evidence of hatching of the eggs was noticed on May 23, and about a week later the small caterpillars were out in numbers. The first brood began to pupate on June 19 and the millers were noticed on June 29. Eggs were found abundant during the following week or ten days, and during the later part of July the second brood was doing the greatest damage, while about the middle of August millers were out in abundance laying their eggs, which will remain on the vines over winter.

Although as a rule the cocoons are found on the tips of the spun up vines, the larvae often travel down the vine a short distance and spin their cocoon on the stem near the ground, while there is a tendency, especially among those of the second brood, to go down into the ground and make an oval cocoon of sand in which they pupate. The eggs are in the majority of cases laid on the under side of the leaves and usually on the five lowest leaves of the lower uprights. The millers in our breeding cages laid their eggs indiscriminately upon the upper or lower surface of the leaf. When the larva hatched upon the upper side of the leaf it would always travel downward to the underside before beginning to feed and remain there a couple of days before traveling to the tip of the vine. On the bog, when attacking the tip, it bores in at the base and after devouring the center uses the shell as a place of retreat. The number of eggs laid upon one leaf may be as high as eleven, though from one to three is the number most frequently found. One single female has been observed to deposit fifty-one eggs. This shows the importance of preventing the development of the first brood of worms, as it needs only a few surviving females to infect an area with a great number of the second brood larvae.

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* (***Rhopobota vaccinlana,*** **Pack.**)

The lateness of the season had one fortunate effect in causing the first brood of black-headed vine-worms to develop slowly. A large percentage was found to be infested with parasites. Under ordinary conditions it is not until the second brood appears that the parasites become numerous, but our breeding cage records show that about one-fourth of the first brood black-heads which were picked off the bog and bred at the Experiment Station were infested with the larvae of a parasitic wasp.

*The yellow headed vine-worms** ordinarily greatly dreaded by the growers, have not been abundant around the Cranmoor or Berlin bogs this year, and only from the vicinity of Mather have reports come of their presence in large numbers. The first brood was late in appearing and its development was slow. Larvae and pupae were brought in from the Mather region on June 26 and all millers had emerged by July 15. A large percentage of the larvae of the second brood were found to bear parasites, the lateness of their appearance and the delay in reaching maturity having given the parasites a better chance to attack them. In addition to the ordinary intestinal parasites, we have found a small yellow-banded wasp preying upon the larvae using them as food for their young. As many as thirty-six were found in one nest.

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* (*Teras minuta*, Rob.)—

The millers of the *cranberry fruit-worm*[*] appeared at the usual time this year, the lateness of the season having had apparently no effect upon the development of the cocoon in the ground. The first millers which emerged July 1 did not find many berries on which to deposit their eggs, as the cranberries had not yet set fruit except on nursery plot 30 where the *Moss berry* was grown. On this there were a sufficient number of berries developed, and as a result the greater number of these were destroyed by the fruit-worm. Normally the Moss berry is said to be free from attack. The egg laying extended over a considerable period, for eggs were still found during the latter part of August. They were invariably found to be laid underneath one of the calyx lobes, no cases having been observed where the eggs had been deposited on the side of the fruit or on the peduncle or hook, so that the young larvae upon hatching must travel the entire length of the berry before they begin to eat their way in.

OTHER CRANBERRY INSECTS.

In addition to the principal insect pests above mentioned, a number of others were found to be more or less injurious. The life histories of some of these we have been able to work out rather completely, that of others only in part, and they will be only briefly mentioned here.

Cranberry tip worm.[†]—This was found fairly abundant but confined to small local areas, especially during the earlier part of the season. The damage done was comparatively slight, but, as there are several broods in a year, the later broods may inflict considerable injury by destroying the terminal bud and thus prevent the setting of fruit the following season. No direct remedies are known, but, as the insect is primarily a feeder on loose-strife, the suggestion presents itself that the eradication of the weeds on the dams will be useful in keeping the tipworms within limits.

Cranberry Girdler (*Cranbus hortbuellus* Hbn).—Though the miller has been found in abundance, being attracted to torches at night in considerable numbers, we have not found nor heard of any injury caused by it to the cranberry vines. It apparently has thus far confined itself to its natural food plants—the grasses.

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[*] (***Mineola vaccinii***, **Riley**)—

[†] (***Cecidomyia oxycoccana***, **Johns**)—

False yellow-headed vine-worm (Dichelia suefureana, Clem.).—As the larva of this is very similar to the yellow head fireworm, it is generally mistaken for it, and the miller, which can be distinguished at a glance, is not recognized as the real culprit. The miller is about the same size as that of the yellow head. The fore wings and anterior part of the body are a sulphur yellow with deep orange markings and the hind wings dark gray. There are two broods, the moths being plentiful in early June and again in late August and September. They are attracted to torches by night. They were noticed last year but were not numerous enough to cause any perceptible injury, but this season they were found in greatly increased numbers. The larvae have the same feeding habits as those of the blackheaded and yellow headed vine-worms and will yield to the same treatment.

The oblique-banded roller (Archyips rosaceana, Harris).—This insect has been noticed for the first time this year and was found widely distributed, but, fortunately, not very numerous. The larva varies in color from light to dark olive green with an orange tinged head and neck and each segment of the body provided with a number (generally five) of white dots, each bearing a bristle. When full grown it is a little over an inch long and is a very voracious feeder. Its work is similar to that of the fire-worm, and we have counted as many as fourteen uprights spun together, and one half grown larva was found to eat an entire cranberry leaf in five minutes. When ready to pupate it makes a closely spun up nest of the tip of some three or four uprights inside of which the dark brown pupa is formed. The pupa stage lasts from about ten days to two weeks, and the miller which emerges is of a dark orange color with two oblique bands of dark brown on the forewings, the hind wings being lighter in color. The millers emerged in numbers about July 17–22, and we suspect the species to have two broods in a year. In captivity the millers did not lay their eggs on the vines but on the walls of the breeding cage, and these eggs did not hatch, but later in the season some berries were found attacked by larvae, which showed a resemblance to the young larvae of this species, which at this stage can hardly be distingushed from a yellow headed larva on superficial examination. The millers are very commonly attracted by torches at night.

The chain-dotted geometer (Cingilia catenaria).—This is the yellow cranberry spanworm or looper, which is found widely distributed, though not very abundant. Our millers were reared from larvae found on the Gaynor bog north of the Experiment Station during the latter part of July. Pupation occurred generally about August 8, the pupae being naked, pale grayish yellow with black spots, enclosed in an open network of coarse yellow threads through which the pupa could plainly be seen. The millers did not emerge until the latter part of September, about two dozen being observed each morning between the hours of six and nine.

The injury done by this looper is as yet comparatively slight. It is a slow feeder and is not numerous enough to cause serious apprehension on the part of the grower.

A number of other spanworms, mostly of a green color, have been noticed, and some we succeeded in rearing, but these did not appear to be numerous enough to cause any appreciable damage.

We also observed a small *snout beetle* or weevil *(Anthonomus suturalis* Lec) which attacks the blossom of the cranberry. During the beginning of August we noticed a number of blossoms which had apparently withered and dropped off the vine. This was at first attributed to blight, but upon closer examination we found that some of the blossoms had been punctured and inside of them we found the grub of a minute, dark red weevil in different stages of development. The adult weevil punctures the blossom by means of its snout and deposits an egg in the opening. This egg hatches into a small pinkish-white grub, which undergoes its entire development and transformation inside this bud. The bud may remain hanging on the vine, apparently uninjured, while the grub eats the inside parts, but the bud never opens and ultimately withers and drops off.

The extent of the damage done was hard to determine at this period as it was not possible to estimate the fraction of fallen blossoms due to blight and due to insect attack, but it may have been considerable.

REMEDIAL MEASURES.

Flooding.—Flooding as a means of getting rid of the insect pests must be considered, *when successful,* the easiest, quickest, and cheapest method to pursue. But the success of a flooding, which must be continued for forty-eight hours, depends upon so many circumstances beyond our control, as temperature of the water, abundance of supply, weather conditions during the flooding, stage of advancement of buds, flowers or fruit, that for Wisconsin we would in general not advise this method of treatment because it is fraught with danger. For the fruit worm or the second brood of the fire-worm we would consider it a hazardous undertaking, as during the latter part of July or August the vines cannot safely be kept immersed for that length of time. Holding of the water until the middle of May might be beneficial in preventing the hybernating yellow heads from depositing their eggs on the vines in spring. This we do not advocate, however, when so few yellow heads are found, as late holding is not advisable. A flooding of two days just after the first brood of fire-worms begins to hatch followed by another flooding about a week later will prove an effective remedy for this insect, as there is not much danger from flooding at this time. Flooding for the second brood of the fire-worm or for the fruit worm should not be attempted unless the following conditions prevail: abundant water supply, temperature of water not above 60° F., cloudy weather and the water to be drawn off quickly in the early morning.

Spraying.—From the results of last season's spraying we felt justified in paying particular attention to this method of treatment this year as being likely to be successful. The mix-re applied this year consisted of copper sulfate four pounds, me six pounds, and Paris green one pound in fifty gallons of ater. In some experiments arsenate of lead was substituted r Paris green, the quality of which was frequently poor. praying was done under adverse conditions at times, and metimes had to be abandoned for lack of sufficient assist- nce. The results were therefore not so satisfactory as could easonably have been expected under better conditions. prayed areas in nearly all cases showed a benefit from the eatment.

Fig. 58 shows the barrel spraying apparatus used in these xperiments.

Spraying on the Experiment Station bog.—The nursery lots on Sections I and J were sprayed with Bordeaux mix- re plus one pound of Paris green per barrel on June 22, ollowed by a second spray on July 17, and a third on ugust 10. In the last spray arsenate of lead was substituted r the Paris green and two pounds of whale oil soap per bar- l added so as to form a more adherent coat of spray over the lossy surface of the berry. The results of these sprayings, pecially in regard to the fruit worm control have been highly tisfactory, showing a decided improvement over the preced- g year. An examination was made on August 3 as to the fect of spraying on fruit worm injury and the results as com- ared with the injury showing on July 21 the previous season shown in the following table:—

ABLE I.—*The per cent of worm infested berries on plots sprayed in 1907, compared with their condition the previous year.*

lot No.	Per cent of infested berries on August 23, 1907.	Condition of plot in regard to fruit-worm injury on July 21, 1906.	Plot No.	Per cent of infested berries on August 23, 1907.	Condition of plot in regard to fruit worm injury on July 21, 1906.
11	5	Badly infested.	47	Free	No record.
12	5	Badly infested.	48	10	Free.
13	1	Badly infested.	49	5	Free.
14	10	Badly infested.	50	25	Badly.
15	1	Badly infested.	51	5	Badly.
16	5	Practically free.	53	5	Badly.
17	1	Considerably injured	54	1	Entirely dest'd.
18	20	Badly infested.	56	2	Slightly.
42	1	Slightly infested.	57	5	Badly.
43	5	Considerably infest'd	58	Free	Slightly.
44	10	Badly infested.	59	1	Slightly.
45	30	Badly infested.	63	5	Badly.
46	20	Slightly infested.	64	5	Generally.

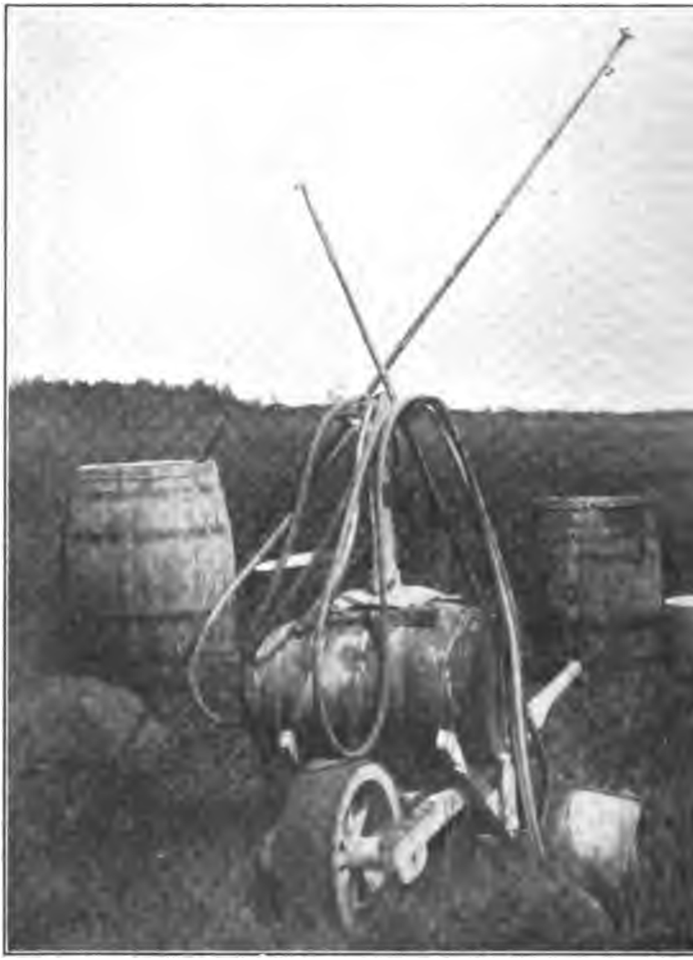

Fig. 58.—Wheel-barrow spraying apparatus used on the Cranberry Ex
Station the past season. This apparatus was also used to apply s
tion in test for killing Wood moss.

This shows a great improvement generally as regards
worm injury. Fire-worms were found to be practica
sent on these plots this season. The results would hav
still more favorable if compared with the condition in t
ter part of August of last year.

On those plots where the fruit-worm infection was co
able, it was noticed that always the high vines had s
most, while the low berries had remained free from att

Sections FI, N. W. ¼ and S. E. ¼ and FII, N. E. ¼ and S. W. ¼ were sprayed three times—June 21 (Bordeaux plus 1 pound of arsenate of lead per barrel), July 17 (Bordeaux plus Paris green, 1 pound per barrel), and August 10 (Bordeaux plus 5 pounds of arsenate of lead). The results of the spraying as compared with the adjoining plots are given in Table II:—

TABLE II.—*The effect of spraying on fruit worm development in 1907*

Section.	Sprayed or unsprayed.	Percentage of fruit worm injury on August 23.
FI, N. E. ¼	Unsprayed	10
FI, N. W. ¼	Sprayed	Free.
FI S. W. ¼	Unsprayed	20
FI, S. E ¼	Sprayed	1
FII. S E	Unsprayed	30
FII. S W	Sprayed	1
FII, N. E.	Sprayed	Free.
FII, N. W	Unsprayed	15

On sections FIII and FIV a third spray was applied, but on FV to FVIII the last spray was omitted over the south half of the section. The condition of the plots on August 23 was as follows:—

TABLE III.—*The influence of number of sprayings on fruit worm development.*

Plot.	Number of times sprayed.	Percentage of injury due to fruit worm on August 23, 1907.
FIII	3	1
FIV	3	1
FV S. ½	2	Nearly free
FV N. ½	3	5
FVI N. ½	3	1
FVI S. ½	2	10
FVII S. ½	2	10
FVII N ½	3	1
FVIII N. ½	3	1
FVIII S. ½	2	5

These results show the practicability of *fruit worm* control through spraying, three applications being more efficient than two. Arsenate of lead has been found, especially when freshly made, to be greatly superior to Paris green. The Paris green, as bought from different dealers, is often impure; in fact, we have used some brands which proved to be practically worthless. As we were often compelled to use Paris green for some of our sprayings outside of the Experiment Station, the results have not been so satisfactory as might be wished in those cases.

Kerosene treatment for fire-worm eggs.—Experiments at the Station showed that the second brood of fire-worm eggs can be prevented from hatching by contact with kerosene. This was also shown by the Gaynor Co., who applied kerosene about the middle of June at the rate of one-half barrel per acre to an area badly infested with the black-headed fire-worm, which treatment was quite effective in preventing their development, although some had flowed to the dams before the kerosene was applied and thus escaped. However, a large percentage of the young terminals were destroyed by this treatment. This would suggest a treatment in early spring for the winter eggs of the blackheaded fire-worm. The area might be flooded, a film of kerosene put on, and the water drawn off, so that while receding the film of oil would be left on the eggs. Care should be taken, however, to apply the treatment before the terminal buds have opened, as otherwise the young shoots are sure to be killed. This treatment, while suggested as promising, should not be used on a large scale until thoroughly tested by the grower.

Dusting the vines with lime and Paris green.—This method for control of the fire-worm and other leaf eating insects has been tried by some of the growers, but apparently the results have not been so favorable as spraying, probably due to the insufficient quantity of Paris green used. We doubt if the lime alone has any injurious effect on the larvae, and believe that beneficial results from the treatment are due to the admixture of the poisonous substance. In most cases the dusting was done with the lime spreader, described in the moss killing treatment on page 308.

Conclusions.—Flooding is only recommended for the first brood of the black or yellow-headed fire-worm.

Spraying is the safest, though more laborious method of ntrol. For fire-worms two applications are, as a rule, fficient; for fruit-worms a third application about the beginng of August is necessary. The addition of five pounds of zin soap to fifty gallons of Bordeaux is strongly recomended, as it greatly enhances the efficiency of the spray.

The fruit-worm can be controlled by spraying.

Arsenate of lead, made by mixing of a solution of 5 parts arsenate of soda with one of 7 parts of acetate of lead ugar of lead)* is to be preferred to Paris green, as the latter ticle cannot be relied upon on account of its frequent adulration.

TABLE IV.—*Cranberry spray formula.*

Bordeaux and arsenate solution.	First spray before opening of buds.	Succeeding spray.
per sulfate	6 pounds.	4 pounds.
ne (fresh)	4 pounds.	4 pounds.
ter	50 gallons.	
enate of lead (mild solution)	3 pounds.	
(strong solution)	5 pounds.	
or		
is green	1 pound.	

pray applied at rate of four barrels per acre.

increase adhesiveness, add three to five pounds resin soap per barrel. (Add last and stir carefully to avoid making suds.)

Spraying is to be preferred to flooding because a well rayed field is guarded against infection from an adjoining g which has not been treated, while to make flooding sucssful, coöperation of the neighboring growers is imperative.

Torches, burning at night, will catch some of the different an-worm millers, false yellow heads, oblique banded roller, d to a certain extent the yellow-headed fire-worm, but are effective as a means of entrapping the black-headed fire-worm fruit-worm miller.

Lastly we again call attention to the advisability of clean lture and the necessity of keeping the dams free from vines. weedy bog cannot be successfully flooded. As the insects, ich have been dislodged from the vines, can crawl up on the

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Dissolved separately in water (warm water will hasten the pro- s). Do not mix until desired for use, then empty into the Bordeaux.

unsubmerged weeds and thus save themselves, while in ing a great part of the mixture is wasted on the wee does not reach the vines. Furthermore on a bog which clean, any injury due to insect attack is at once ap while if the vines are hidden by weeds, the damage, finally visible, has generally spread too far to leave an for successful control. Fig. 59 is from a photograph of badly infested with *broad-leaf*, a portion of which ha weeded. The cost of the weeding was about fifty doll acre but the results showed that the work was profitable

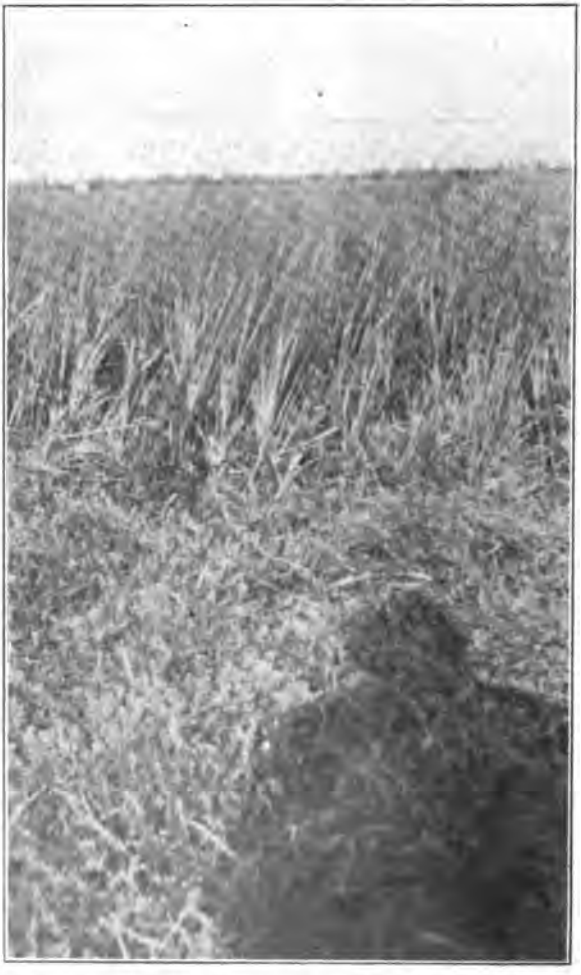

Fig. 59.—A cranberry bog badly infested with broad-leaf. A part of
has been profitably weeded.

ERTILIZER EXPERIMENTS WITH SUGAR BEETS DURING 1906 AND 1907.

I. EXPERIMENTS DURING THE SEASON OF 1906.*

F. W. WOLL AND C. W. STODDART.

'he purposes of the experiments conducted during the sea-
of 1906 were to study the adaptability of types of Grant
Vernon County soils to sugar beet culture, and to study
system of fertilization that would produce the best results
factory purposes considering both the yield and the quality
beets.

'he investigation was conducted by the Departments of
icultural Chemistry and Soils, of our Station. The ex-
iments were planned by Professor Whitson and one of us
.), and the former had charge of the soil work until his
arture for Europe, on leave of absence, while the field
k, including the harvesting and analysis of the beets, was
e under the direction of the latter. Messrs. Martin Nel-
, now of the Nebraska Station, Frank Stark of Randolph,
consin, and Geo. A. Olson, Assistant Chemist, rendered effi-
t aid in the planting, harvesting, and analysis, respectively,
he beets grown on the various farms.

Experiments were conducted on ten different farms, viz,
r at Lancaster, Grant County (Marlow, Abrams, Wright,
Block farms); two near Viroqua, Vernon County (Coun-
Asylum and Michelet farms); three at Chippewa Falls,

Condensed from Bul. 150 of this Station.

Chippewa County (Lyberg, Brunstad, and Witherick fa and one near Madison, Dane County (Hill farm). Th on the experimental fields include characteristic typ Wisconsin soils from light sandy loams to heavy clays represent large areas of land contributory to the various factories in the State.

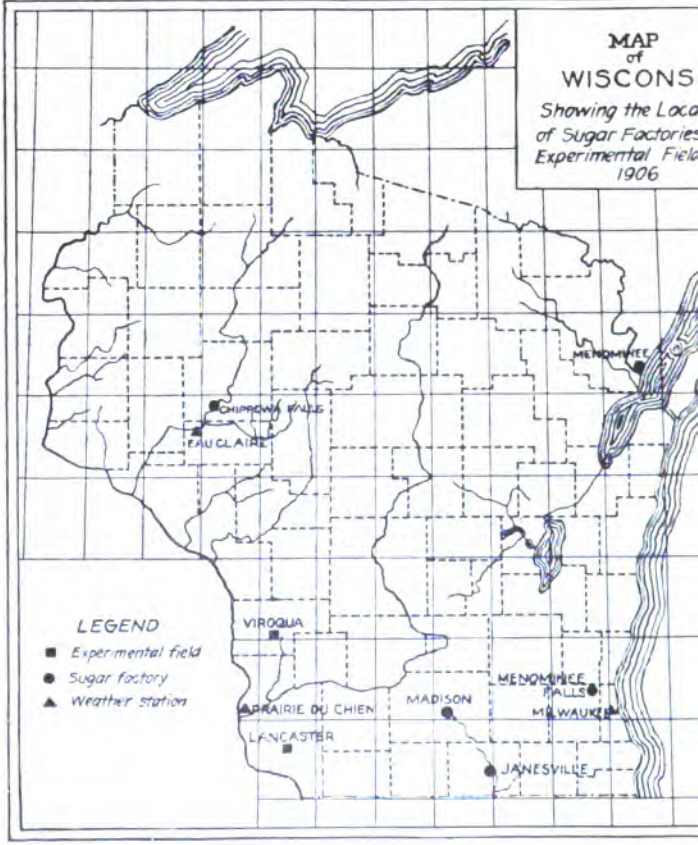

Fig. 60. Location of experimental beet fields.

A one-acre field of sugar beets was grown on each of th farms under different systems of fertilization, and repre five rows of beets on each plot were harvested in th weighed, and sampled, and the beets analyzed for their contents. The acre-fields were in all cases divided into equal plots which were treated as shown below:—

TABLE I.—*Arrangement of plots on beet fields.*

Plot No.	Designation.	System of fertilization.
1 and 7	Bl.	No fertilizers (control plots).
2	K	Potassium sulfate, at the rate of 180 pounds per acre.
3	P	Acid phosphate (14 per cent), at the rate of 420 pounds per acre
4	KP	Potassium sulfate and acid phosphate, at the rates given.
5	NKP	Potassium sulfate and acid phosphate, at the rates given, with sodium nitrate at the rate of 300 pounds per acre.
6	FM.	Farmyard manure, at the rate of about 10 loads (10 tons) per acre, containing amounts of fertilizer ingredients, approximately the same as in the minerals applied on Plot 5.

In order to determine the effect of lime as a fertilizer on the different soils, one-third of the fields (Section B; see Fig. 61), received, in addition, applications of slaked lime at the rate of one-half ton per acre. In five cases the limed plots were divided into two sub-plots, on one of which lime was added at the rate of one-half ton and on the other at the rate of one ton per acre. The accompanying diagram will show he arrangements of the plots on each field.

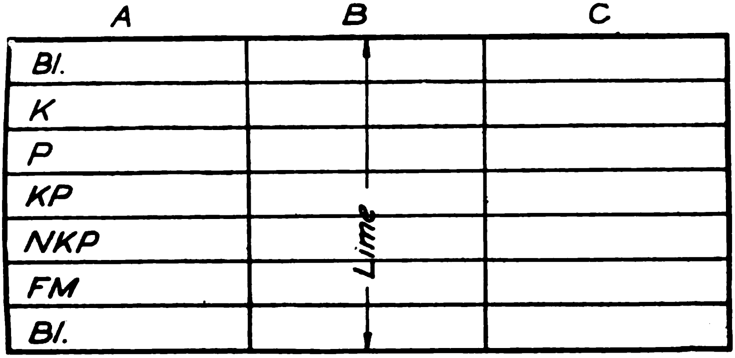

Fig. 61.—Arrangement of experimental plots.

The soils on the various beet fields were carefully sampled n the spring of 1906, the surface samples being taken to a epth of 8 inches. The detailed results of the chemical and nechanical analyses made are given in the bulletin referred o. They show that the soil on Abrams' farm contains he most clay, and that on Brunstad's farm the most and. The four soils at Lancaster are, in general, very similar in mechanical composition, and the same applies to Vernon County Asylum and Michelet farms, as well as to the Lyberg and Brunstad farms. The data for chemical composition show a surprising agreement in the amounts of the various constituents present, aside from the total nitrogen. All of the soils evidently contain ample quantities of valuable plant food constituents, provided a sufficient amount of each is available for the needs of the growing crop. As would be expected the soil of Michelet's farm, a rich prairie loam, is high in total nitrogen, as is also that of the Vernon County farm, while the Lancaster soils, except that of Abrams' farm, contain relatively small amounts.

The percentage of carbon dioxid in the various soils is very low, and the differences found are, therefore, of little importance. At least 90 per cent of the lime in the different soils is present in forms other than carbonate, viz, as silicate for the most part.

DATA RELATING TO BEET FIELDS.

The beets in Grant and Vernon counties were grown under contract with the United States Sugar Company at Madison, and the care and cultivation of the crop were under the direction of the agricultural manager of this company. In the same way the Chippewa County beets were grown for the Chippewa Sugar Company, in accordance with the directions issued by them. The beets on the Hill Farm were grown under the directions of the Agronomy Department of this Station, the work being in charge of Prof. R. A. Moore and Instructor A. L. Stone.

An effort was made in all cases to obtain fall-plowed land for these experiments, but we were not successful in every instance. The fertilizers were spread broadcast shortly before planting, and harrowed or disced in. The lime was distributed in small heaps in the middle section of each field, and water sprinkled on each pile, causing the lumps to crumble into a fine, dry powder. In a few hours this could be scattered evenly over the whole section to receive lime.

The seed used was Kleinwanzleben seed grown by Heine (Kloster Hadmersleben).

CHARACTER OF SEASON.

The character of the season in the region of the experimental fields was, on the whole, favorable to sugar beets; an abundance of rain fell throughout the growing season except during the months of July and September at Madison, in June at Prairie du Chien and in July at Viroqua and Prairie du Chien. The temperature was low in the early part of the summer in the southern part of the State, but rather above the average, in general, for the entire season, at all places where the experiments were conducted.

HARVESTING OF BEETS.

The various fields were visited at least twice during the growing season by a representative of the Station, and careful notes were taken as to the condition of the crop at the time. Two inside 100-foot rows of beets that had as nearly a perfect stand as possible were selected for weighing and sampling, October 9 to 20, at the various experimental fields. In some cases the yield was obtained from the beets dug in two 50-foot rows. After weighing the beets dug, a dozen beets of average size were in every case selected for analysis, carefully put in sacks, placed in wooden boxes, and shipped by fast freight to Madison, where the samples were carefully analyzed for sugar content and purity, generally the same day they were received.

QUALITY AND YIELD OF BEETS.

The detailed results obtained on the different fields as to the yield of beets and sugar will be found in bulletin 150, where the data obtained in the examination of beets as to the sugar content and purity are also given.

Quality of beets.—There was a range in the average sugar content of the beets for all plots of 13.54 per cent (County

Asylum farm) to 15.86 per cent (Marlow farm). T
ity coefficients of the beets, on the other hand, rang
84.9 per cent (Michelet farm) to 93.9 per cent (W
farm). All of these results are very satisfactory f
standpoint of the sugar manufacturer, especially con
the fact that the minimum sugar content and purity
companied by estimated yields of beets of 31,830 pou
38,179 pounds per acre, respectively.

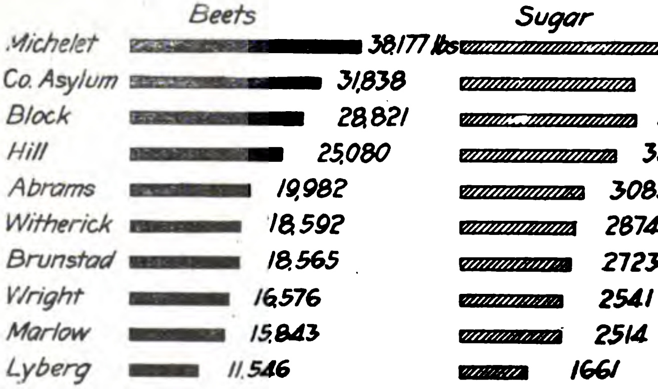

Fig. 62.—Calculated yields of beets and sugar per acre on the vari
mental plots.

The most striking result of this investigation as reg
quality of the beets raised on the different fields is
Lancaster fields were found to produce sugar beets
tional richness and purity. From previous work in
the adaptability of the soils of our State to the cu
sugar beets, it appeared that the soils in the sout
counties, belonging to the region known to geologis
"driftless area," were not capable of producing sugar
the standard quality required by manufacturers, viz,
12 per cent sugar in the beet, with a minimum puri
cient of 80 per cent. The average results for the f
caster farms were from three to four per cent abov
standard for sugar content and from ten to nearly thi
cent above factory standard for purity. In this respe
fore, the results obtained in the season's work wer

tisfactory and furnish conclusive evidence that the farmers
this section of the State may safely take up sugar beet culre, as far as the quality of their beets is concerned.

Yields obtained.—The yields of beets and of sugar secured
om the different fields, showed a greater variation and a less
tisfactory condition than with regard to the quality of
ets. There was a wide range in the estimated yield of the
ets per acre, viz, from less than six tons (Lyberg farm) to
er nineteen tons (Michelet farm), and in the yield of sugar
r acre, from 1,661 pounds (Lyberg farm) to 5,206 pounds
Iichelet farm). The low yield on the former farm was
used to a large extent, at least, by the late planting; it is
pecially important that beets on light soils be planted early.

Only four out of the ten fields produced satisfactory yields
beets, viz, twelve tons or more per acre. But it should be
membered that only a small portion of each field received
ch fertilization as would be likely to produce the best results.
onsidering the plots that were properly fertilized, eight of
e ten fields produced twelve tons of beets or more per acre.
the case of six of the farms where the experiments were
rried on, the owners or renters had not had any previous exrience in the culture of sugar beets and could not, therefore,
expected to care for the crop in such a manner as would
cure the largest yields which the land was able to produce
der the restrictions of the experiment as to fertilization.

EFFECT OF FERTILIZERS.

We shall now briefly consider the effects of the applications
different kinds of fertilizers on the sugar beets grown on
e various fields.

Hill farm.—The results show that KP and NKP* improved the quality of the beets, while no marked difference
as obtained in the case of FM, K, and P plots, as regards the
er cent of sugar in the beets. An improvement in the purity
the juice was, however, effected by all the fertilizers ap-

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* See p. 323 for explanation of abbreviations.

plied, although to a very slight extent (0.2 per cent case of the KP plot.

As regards the yields obtained, we note that NKP c increase in yield of beets of nearly five tons and in of sugar of 1,665 pounds per acre over the yields of trol plots. The KP plot increased the yields by 1,69 of beets and 404 pounds of sugar, and the FM plot the yields by about half a ton of beets and 183 p sugar. In all probability the increase shown on th the P plots both of sugar and of beets is due to un errors of field experimentation rather than to an ac terious influence of the fertilizers applied. We are rate, justified in concluding that at the time of sam beets, October 9, K and P had produced no improv the crop as regards yields of beets or of sugar.

There was a marked decrease in the average tes beets at harvest time compared with the test at sampling, viz, on the average 1.3 per cent less sugar cent lower purity. The decrease is accounted for b tervening heavy rains. The roots always absorb wa such conditions, with the result that the percentage is reduced. This reduction is necessarily accompani increase in the tonnage of beets, since sugar is not in the roots, so long as there is no new growth of lea

The results obtained at harvest time show, as in th the first sampling, that NKP and KP improved th of the beets and this was also the case with FM ar most marked improvement occurring in the NKP p yielded beets of 1.12 per cent higher sugar content an cent higher purity than the average of the control pl plot also produced the largest increase in the beets and viz, at the rate of 9,380 pounds of beets and 1,631 sugar per acre. FM produced next best results, this lowed by the KP, K, and P plots, all of which imp yields of beets from less than one to more than two acre and the yields of sugar from 345 to 766 pounds

Lancaster soils.—The largest increase in the yiel as well as sugar over that obtained on the control cured from the NKP plots in the case of all four fields. The crease varied on the four fields from nearly four to seven ns of beets and from 1,250 to 1,942 pounds of sugar. FM so produced increased yields of beets on all these fields, viz, om 1,258 to 8,605 pounds of beets and from 188 to 1,014 unds of sugar. K and P, on the other hand, did not give y increased yield on the Marlow and Abrams farms, while ere was an appreciable increase on the other two farms ex- pt that there was apparently obtained a decrease in yield on e block farm from the P plot. KP increased the yields in ery case except on Abrams' farm.

Vernon County soils.—The heavy yields obtained on both ese farms from the control plots were further increased in e case of every plot on the Michelet farm and in the case of e K and KP plots on the County Asylum farm. The in- eased yield on the former farm was the largest from P, KP, FM, K, and KP following in the order given, the in- ease in the calculated yield in the case of different plots nging from 1,579 to 7,342 pounds of beets per acre and from 9 to 1,191 pounds of sugar.

The results on the County Asylum farm, on the other hand, owed a marked increase on the K and KP plots, of 4,713 d 6,178 pounds of beets, and 638 and 856 pounds of sugar r acre Decreased yields were obtained on the other plots. is difficult to understand how the results on the NKP and M plots can be correct, in view of the healthy appearance of e beets on these plots during the growing season and in view the general increase in yields that has been found for these rtilizers in the case of all other fields. The results obtained the different parts A, B, and C, of these plots are, however, ncordant, and no satisfactory explanation can therefore be ven as to the low yields on the NKP and FM plots in this ld. The fact that K gave the largest increase of any ferti- zer applied is significant; the increase from the KP plot be- g also very marked. The explanation that appears most ausible is that three crops especially exhaustive of potash ere grown on this field during the preceding seasons, viz, tabagas, beans and potatoes, and the supply of available potash in the soil may therefore have been reduce imum. This does not explain, however, why the NI fertilizations should not have proved at least as the K or KP alone.

Chippewa Falls soils.—None of these fields pr satisfactory average yields owing to the depletion of the soils through previous continuous croppin sults show, however, that by proper fertilization can be secured. NKP and FM produced the best an increase of three to five tons in yield of beets, 1,500 pounds in yield of sugar (FM on the Bruns cepted). K produced a very uniform increase in the three fields of one to two tons of beets, and o pounds of sugar per acre. P did not increase t beets, but because the beets on this plot were rich than those on the control plots, the yield of sugar increased.

EFFECT OF LIME.

The effect of lime on the quality and yields o sugar was studied in the manner previously explai sults of the weighings and analyses of the beets g different farms are briefly commented on in the fo

No effect was noticed from the application of *Hill farm.* On the contrary, it would appear th positive detriment, since the yields of beets and slightly lower on the limed plots than the averag limed portion on either side.

On the *Lancaster* soils the beets responded to l the case of the Wright field and that part of the which received FM. In the latter case the low a lime was detrimental, nearly two tons less of be pounds less of sugar being obtained on the limed unlimed portions. Where FM was applied with th was, on the contrary, an increase in yields at the a ton of beets and 384 pounds of sugar per acre. able result is doubtless due to the effect of lime on atter of the manure in hastening decomposition and thereby etting free latent plant food.

Lime produced a good increase of both beets and sugar on e two *Vernon County farms.* The double application of lime the case of the Michelet farm caused a marked decrease yields. No satisfactory explanation can be given for this sult since the soil is rich in organic matter, the decomposion of which is generally supposed to be favored by heavy plications of lime.

A remarkable increase in production was secured through e application of lime on all three experimental fields at *hippewa Falls.* This statement should be modified to the tent that on the heavy clay soil (Witherick farm) the uble application of lime was required to produce this relt. In the case of the two other fields no further advange was obtained by the double application of lime.

The preceding results were obtained by a comparison of the mmary data for the limed and unlimed portions of the reective fields. These yields were, of course, influenced by e application of the various fertilizers and the effects of the ning noted do not therefore necessarily express the effects at would be secured by applications of lime alone or in comnation with the fertilizers applied on the respective plots. we compare the yields on the limed and unlimed portions the control plots we obtain essentially the same results as ated above, viz, that the lime was a detriment or at least of advantage in the case of all the fields but Abrams, County sylum, and Chippewa Falls fields, with single applications lime, while in the case of double applications of lime a arked increase was obtained on every field but one, the Mielet farm. The increase was especially marked on Brunad's field where the yields on the control plots were more an doubled by applications of lime.

We have already noted that on the Vernon County Asylum rm, K and KP gave the largest increase in yields of any rtilizers applied, and it is found by comparing the effect of e application of lime on these two plots that the calculated yield of beets was increased through liming by 2 and that of sugar by 28 per cent. Lime in conn KP caused a small increase, viz, 4 per cent in t beets and 5 per cent in that of sugar.

The results of last season's trials given in the pages are quite marked, when we consider that the l plied in the spring, only shortly before planting order to obtain best results from applications of lim be distributed in the fall and thoroughly worked in so that the beneficial chemical changes in the so place in time for the following season's crop. Unc ditions we feel safe in concluding that the benefi of liming observed in many cases would have been hanced, if the lime could have been put on in the

ECONOMY OF FERTILIZATION.

The rates at which the various fertilizers were the experimental plots are shown on page 323. market prices of fertilizers the sulfate of potash ap cost $4.50 per acre, the acid phosphate $2.94 pe potash and phosphate $7.44; the complete fertili potash and phosphate $15.54 per acre, and the fa nure $5.00 per acre (50 cents a load). In order good business proposition the increase in the crops the different systems of fertilization must more th the cost of the fertilizers applied, and at $4.50 beets the yield on the K plots must, therefore, b by more than a ton in order to produce a profit; th plots must be increased by more than ⅔ of a ton; at least 1⅔ tons, the NKP by 3½ tons, and the tons. By comparing these figures with the incre obtained on the different experimental fields it can ascertained whether or not the fertilizer paid, and noticed that, as a general rule, such was decided where any marked improvement was produced.

RELATION OF COMPOSITION OF SOIL TO YIELDS OF BEETS.

As previously stated, but relatively small differences occur-
d in the composition of the various soils as regards all con-
tuents but total nitrogen. Since the yields of beets
cured from the unfertilized plots of the different fields rang-
from about four to nearly eighteen tons to the acre, it fol-
ws that neither a chemical nor a mechanical analysis of a soil
n be considered of much benefit for determining its value for
op production, at least for beet culture. In the case of the
termination of total nitrogen in the soil there is at least a
ir agreement with the yields obtained. We thus find that
e soil on the field producing the highest yields of beets and
gar (Michelet farm) also had the highest nitrogen content,
d the next highest yield (Vernon County farm) corresponds
the next highest nitrogen content in the soil. On the other
nd, the two fields producing the lowest yields contain rela-
ely small amounts of nitrogen. A comparison of the re-
lts for the sugar content of the beets and of the per cent of
trogen in the soil will, furthermore, in general show a fair
reement between the results in this way, that the soils low-
t in nitrogen produced beets of the highest sugar content, and
ce versa. The reason for this is easily seen, and is to be
und in the fact that soils low in nitrogen generally produce
ets of a small size, in which the elaboration of sugar can go
farther in normal seasons, than is the case with rich soils
hich produce beets of a large size that are not likely to ripen
well, owing to cloudy and cool fall weather.

CONCLUSIONS.

The investigation here reported covers a period of one sea-
n only. This fact should be kept in mind when conclusions
e drawn from the results obtained, since climatic and other
nditions vary greatly from year to year, and will influence
a marked degree the quality and yield of crops, as well as
e effect of different fertilizers on crop production. Notwith-
anding this limitation, we feel warranted in considering

some results of the investigation conclusive, and a brief statement of these facts will therefore be presented herewith.

Sugar beets in southwestern Wisconsin.—Perhaps the most striking result brought out in the investigation is the fact that sugar beets of a rich sugar content and high purity can be raised in the southwestern part as elsewhere in our State. This is contrary to the opinion that has prevailed since the publication of the work in beet culture conducted by our Station during the nineties, which apparently indicated that the soils in the southwestern counties, geologically known as the "driftless area," were not able to produce beets of sufficiently high grade to be used for the manufacture of sugar. Many samples of sugar beets from the experimental fields in this section containing 16 to 17 per cent of sugar and of a purity of 92 per cent or over, were analyzed last fall. The average per cent of sugar in the beets on each of the fields was 15.86, 15.58, 15.51, and 15.22 per cent, and the average purity coefficients for the beets grown on the same fields in the order given were 90.8, 91.5, 92.6, and 91.7 per cent. The general averages for beets grown in this region last year, 15.49 per cent sugar and 91.6 per cent purity, are 3.5 per cent and 11.6 per cent above factory standards for sugar and purity, respectively. The averages of thirty-five samples of beets grown in Grant County and analyzed by us prior to 1899, were 10.55 per cent sugar, with purity of only 70.7 per cent. It is evident, therefore, that faulty methods of culture and not the soil were responsible for the poor showing made in the past by farmers in this section.

This result is especially gratifying since it settles the question in the affirmative whether or not the farmers in Grant, Lafayette, Richland, and other southwestern counties can successfully raise beets for factory purposes, and whether sugar factories can ultimately be established there with a fair assurance of success, when the farmers become sufficiently interested in the crop to raise beets on a large scale.

When we consider the yields of beets obtained last year on these experimental fields, a less satisfactory condition is revealed, since the best crop harvested for the different fields yielded at the rate of from eight to fourteen tons per acre. These are but slightly heavier yields than those obtained on the control plots which received no fertilizer whatever, and it is evident that the yields can be largely increased by a proper system of fertilization. In fact, the plots which received a complete fertilizer of nitrate, phosphate and potash yielded at the rate of 11.0, 14.8, 12.8, and 19.0 tons to the acre, for the four fields in this locality, showing the possibilities of the soils in this region for beet culture under proper fertilization. On account of the various adverse conditions under which these experiments were conducted, the yields given cannot be taken as maximum, although it probably is not to be expected that a much higher average for a number of seasons can be reached.

The best methods for the culture of sugar beets for factory purposes and details as to the proper treatment of soils of different kinds for growing this crop cannot be given in this place, nor is it necessary to do so, since field agents of the sugar companies doing business in the State spend their entire time during the growing season in instructing farmers as to the best methods of treatment of soils and culture of the crop. It may be stated in general, however, that beet land should always be fall-plowed, preferably following clover which has been heavily manured the previous year. The expense of growing a heavy crop of beets is but slightly greater than that of growing a small crop, whereas the gross returns on the former may be two or three times those of the latter, and the net income from a beet field will therefore be many times larger for a good crop than for a poor one; hence provision should be made to raise beets on fertile land only. Beets will never prove a satisfactory crop on soils that either have been depleted by continuous cropping or are naturally in a low state of fertility.

Fertilizer requirements of experimental soils.—With regard to the fertilizer requirements of the experimental soils, the investigation has shown that in all cases but one the largest yields of beets and of sugar were obtained on the plots receiving a complete fertilizer of nitrate, phosphate, and potash. Farmyard manure, supplying corresponding quantities of fer-

tilizing ingredients, as a rule, produced the next
and considering the cost, is by far the chea
Since it was applied in the spring on the expe
the crop was not benefited as much as would hav
if manured in th fall, and the relative economy
would then have been brought out still more str

In the case of the Vernon County, Chippewa
of the Lancaster fields, potash alone produced a
ficial effect on yields of beets and sugar, while p
proved of benefit on the Hill Farm and the prai
Vernon County.

Effect of lime.—Lime applied at the rate of
per acre produced a beneficial effect on the y
at two of the Lancaster fields, on the Vernon C
field, and on the three fields at Chippewa Falls
of the heavy clay at the latter place a double
lime was necessary to increase the yield of beets
The improvement from liming these soils was
and suggests the advisability for farmers in
studying the effect of lime on their soils.

II. EXPERIMENTS DURING THE SEASON

F. W. WOLL AND R. A. MOORE.

The experiments during the past season w
for the purpose of studying the fertilizer requi
types of Wisconsin soils for sugar beets, viz, the
on the Agronomy field at the Experiment Stat
Madison, and the light sandy soil on the Nor
tion farm, at Iron River. One acre of beets
the Agronomy field and one-half acre on the
Station farm, the fields being in each case divide
plots. The arrangement of the plots and the
tilization adopted were similar in both cases;
cluded trials with the three fertilizer ingredi

hosphoric acid, and potash, applied alone or in combination ith each other, as shown in the following statements:—

TABLE I.—*Arrangement of plots on beet fields.*

Number of plot.	Fertilization.	Quantities applied on one-tenth acre.
and 10	None	(Control-plots.)
	N	20 lbs. sodium nitrate.
	NK	20 lbs. sodium nitrate. 20 lbs. potassium sulfate.
	NP	20 lbs. sodium nitrate. 40 lbs. acid phosphate.
5	NKP	20 lbs. sodium nitrate. 40 lbs. acid phosphate. 20 lbs. potassium sulfate.
7	K	20 lbs. potassium sulfate.
8	P	40 lbs. acid phosphate.
9	KP	20 lbs. potassium sulfate. 40 lbs. acid phosphate.

The seed used was Braune Elite sugar beet seed, furnished by the Wisconsin Sugar Co. The character of the past season may be studied from the meteorological data given in the following table. It will be noticed that the season was characterized in the southern part of the State by abundant precipitation and low temperatures during the summer months. As a result the growth of the beets was greatly retarded and their sugar content unsatisfactory, until late in the season when there was a marked improvement in both the percentage of sugar and the purity of the beets.

Conditions at the northern Sub-Station were much more favorable to beet culture than around Madison, but there, as will appear from the following discussion, the yields were doubtless reduced considerably through the severe drought that occurred during the early part of the summer.

TABLE II.—*Summary of meteorological data, 1907.*

Station.	County.	Elevation.	Month.	TEMPERATURE.		PRECIPITATION.		Number clear days.
				Mean.	Departure from normal.	Total.	Departure from normal.	
		Ft.		Deg. F.	Deg. F.	In.	In.	
Madison.	Dane.....	974	May......	49.0	—8.7	2.69	—0.92	9
			June ...	64.6	—2.8	2.80	—1.30	11
			July.....	71.0	—1.1	5.84	+1.82	9
			August..	67.4	—2.3	3.59	+0.47	14
			Sept.....	60.2	—1.9	4.69	+1.45	11
			October.	47.4	—2.6	1.14	—1.26	13
Average and total	....	......	....	**59.9**	**—3.2**	**20.75**	**+0.26**	**67**
Ashland...	Ashland...	647	May.....	42.6	....	3.87	+0.86	12
			June.....	63.2	....	1.54	—2.73	17
			August...	65.1	....	3.47	....	19
			Sept.....	56.6	....	2.99	1.71	13
			October.	46.0	—1.9	0.52	—2.61	17
Average * and total	....	......	....	**54.7**		**12.39**		**78**

*Exclusive of month of July.

The writers were assisted in the conduct of the experi here described by Messrs. Stone, Delwiche, and Ols whom credit is due for the field and laboratory wor formed.

A. Agronomy field.—The field on which the beets grown was a clay loam of quite uniform grade and te It was in oats in 1906, and in clover, 1905, the latter turned under prior to sowing the oats. It was only in state of fertility. The field was fall-plowed in 1906 an pared for planting on May 3, 1907, the fertilizers to plied on the various plots being put in at that time. beets were planted on May 18, but owing to the col weather prevailing during the early part of the summer a poor stand was obtained; the rainfall at this time heavy that the ground was completely saturated for days; as a result it was impossible to cultivate the field right time and this grew very weedy. It was, therefo cided to disc and replant the entire field, which was d June 13. This is at least a month later than beets sho

nted in this section, and satisfactory results could for this
son hardly be expected in the season's work on this field.
The beets were thinned on July 13 and cultivated down to
y 31, when the field was laid by. The first samples of
ts were taken on October 18 and analyzed in our labora-
; the results of the analyses showed that the beets con-
ed on the average at that time 12.62 per cent sugar, with
average purity of 86.0 per cent. The yield from the en-
field calculated from the weights of beets on the various
s in fifty feet of an average inside row was only about
tons, the yield of sugar being about 2,260 pounds per
. At this time the NKP and NK fertilizers produced the
hest increase over the yields obtained from the unfertilized
s, with K and KP next, in the order given.

The beets were harvested on November 11, and samples
lyzed November 15. The beets harvested off the various
h-acre plots were weighed, and the figures for the yields
acre given in the following table are calculated from the
a thus obtained:—

LE III.—*Yields and analyses of sugar beets, Agronomy field, 1907.*

OT NO.	Fertilization.	Sugar.	Purity.	YIELD OF		DIFFERENCE BETWEEN CALCULATED AND ACTUAL PER CENTS AND YIELDS.			
				Beets.	Sugar.	Sugar.	Purity.	Beets.	Sugar.
		Per cent.	Per cent.	Lbs.	Lbs.	Per cent.	Per cent.	Lbs.	Lbs.
....	Bl	16.95	89.9	5,510	934	....	....	....	....
....	N	16.79	90.0	10,770	1,808	− .24	+ .1	+ 4,784	+ 787
....	NK	17.62	90.8	12,700	2,238	+ .51	+ .9	+ 6,238	+1,130
....	NP	16.33	86.6	11,690	1,909	− .86	−3.3	+ 4,752	+ 714
....	NKP	17.43	90.0	13,220	2,304	+ .16	+ .1	+ 5,806	+1,022
....	Bl	17.35	89.9	7,890	1,369	....	....	....	...
....	K	17.59	89.9	11,190	1,968	+ .46	+ .7	+ 3,470	+ 643
....	P	15.42	86.0	18,050	2,783	−1.50	−2.5	+10,500	+1,503
.. ..	KP	16.63	89.9	17,370	2,889	− .08	+2.1	+ 9,990	+1,654
....	Bl	16.50	87.0	7,210	1,190	....	....	....	....
erage and otals......	....	16.78	89.1	115,600	19,392	....	....	....	....

The quality of the beets had greatly improved up to the
e of harvest, there being an average increase in the percent-
of sugar in the beets from the different plots amounting to
per cent, and in the average purity of the beets, of 3.1 per

cent. On the other hand, the yield secured was lower than that calculated from the weights of beets in rows fifty feet in length on each plot obtained October 15, as is quite natural, since rows with a full stand of beets were selected for sampling at that date. The very unfavorable season which necessitated the replanting of the beets, reduced the yield far below those obtained in earlier years. on our experimental fields. The average yield obtained during eleven seasons, 1890 to 1904, was 17 1-3 tons of beets and 4,500 pounds of sugar per acre.* This year the yield on any plot did not much exceed nine tons of beets and 2,800 pounds of sugar per acre.

Under these conditions it does not seem advisable to make extended comments or deductions as to the relative influence of the various fertilizers on the yield and composition of the beet crop, since there can be no certainty that the effect of the separate fertilizers or the combinations of these under the adverse conditions of the past season went in the same direction as would be the case in normal seasons, with an average growing period and under ordinary climatic conditions. All the fertilizers applied increased the yields of both beets and sugar, the most pronounced results being obtained with the P and KP fertilizers. Contrary to what might be expected, the increase in the yields on the NKP plot was not quite so large as on the two plots given, as was actually found to be the case in our last year's experiments on the adjoining field.†

B. Iron River.—The beets on the half-acre experimental field were grown under similar conditions as those on the adjoining field reported on in the following pages under "Tests with Grains and Forage Plants at the Northern Sub-Station Farms," (see p. 405). The data secured at harvest time are summarized in the following table:—

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* See Bul. 123, p. 8, of this Station.

† Bul. 150, p. 24, of this Station.

TABLE IV.—*Analyses and yields of sugar beets, Iron River Sub-Station, 1907.*

PLOT No.	Fertilization.	Sugar in beets.	Purity.	Yield of beets.	Yield of sugar.	DIFFERENCE BETWEEN CALCULATED AND ACTUAL PERCENTAGES AND YIELDS.			
						Sugar.	Purity	Beets.	Sugar.
		Per cent.	Per cent.	Lbs.	Lbs.	Per cent.	Per cent.	Lbs.	Lbs.
1..............	Bl	19.56	81.4	15,060	2,916	....	....	....	....
2..............	N	19.87	91.5	22,160	4,403	+ .36	+8.7	+ 7,696	+1,580
3..............	NK	18.03	83.4	26,080	4,702	-1.43	- 0.8	+12,212	+2,002
4..............	NP	20.65	90.0	22,500	4,646	+1.14	+4.4	+ 9,228	+2,065
5..............	NKP	19.39	89.3	17,760	3,441	+ .03	+2.3	+ 5,084	+ 990
6..............	Bl	19.30	88.5	12,080	2,331	....	....	....	....
7..............	K	17.11	84.9	16.300	2,789	+2.47	-4.3	+ 3,380	+ 253
8..............	P	19.80	82 9	16,280	3,224	— .06	—7.0	+ 2,520	+ 482
9..............	KP	19.84	89.5	17,460	3,464	— .30	—1,1	+ 2,860	+ 518
10..............	Bl	20.42	91.4	15.440	3,153	....	....	....	....
Average and totals........		19.38	87.3	181,120	35,101	....	....	....	....

The results show that the fertilizers applied had a marked influence on the yields of beets harvested and on their quality. By comparing the yields of plots 7 and 9 with those obtained from plots 2 to 5, inclusive, it will be seen that N had a more marked influence in improving the yield of beets than any other single fertilizer ingredient, with K second. The quality of the beets was, in general, improved by the applications of P and of N, while K had a decidedly depressing influence on both the sugar contents and the purity of the beets. If the yields of sugar from the different plots are compared, however, it will be seen that the NK and NP plots gave the largest increase over the yields on the control plots with the N and NKP plots following in the order given.

It would appear from these results that nitrogen alone is the most efficient fertilizing ingredient that can be applied on the sandy soils of this region, and that but slight improvement was obtained in the yield of sugar, at any rate, by applying in addition either potash salts, or phosphates. Neither of these latter fertilizers had as marked an influence in increasing the yield of sugar per acre as had sodium nitrate alone, and this fertilizing ingredient, with either potash or phosphates alone, produced considerably better results than when both these were applied in connection with nitrates. The results of this year's work, therefore, indicate that in a dry season at least, the best system of fertilization for sugar beets on the sandy soils in northern Wisconsin will be an application of nitrogen alone, or of nitrogen with potassium or phosphorus, and not with complete fertilization with all of these components.

BSERVATIONS UPON THE PREVALENCE OF EARLY POTATO BLIGHT IN WISCONSIN.

J. G. MILWARD.

The potato investigations conducted by the Wisconsin Ex-
eriment Station the past four years have shown that early
otato blight *(Alternaria solani)* is an important factor in de-
ermining the annual yield of potatoes in Wisconsin. Al-
hough during the past four years late blight *(Phytophthora*
festans) has been unauthentically reported from the lake
ore counties, not a case of this disease has come under the
servation of this Station. The fact that late blight is prac-
cally unknown in the State, assists greatly in determining
e losses attributed to the early blight fungus.

The science of meteorology has thrown considerable light up-
the recurrence of diseases parasitic to our farm crops. The
riculturist has learned to anticipate losses from fungous
seases by the approach of weather conditions known to be
vorable to their attack. In some cases a comparison with
e records of the Weather Bureau has shown that there is
ite a constant relation between seasons of serious loss from
ngous diseases and the weather conditions for the same
riod. In the study of early potato blight, it is important to
rrelate the facts gained from a systematic study of the
sease producing fungus with the more practical agricultural
oblems involved in available means of control. Although
fungus (*Alternaria solani*) has been closely studied by ag-
ultural botanists in its association with early potato blight,

among potato growers tip burn, arsenical poisoning, etc., are still confused with this disease.

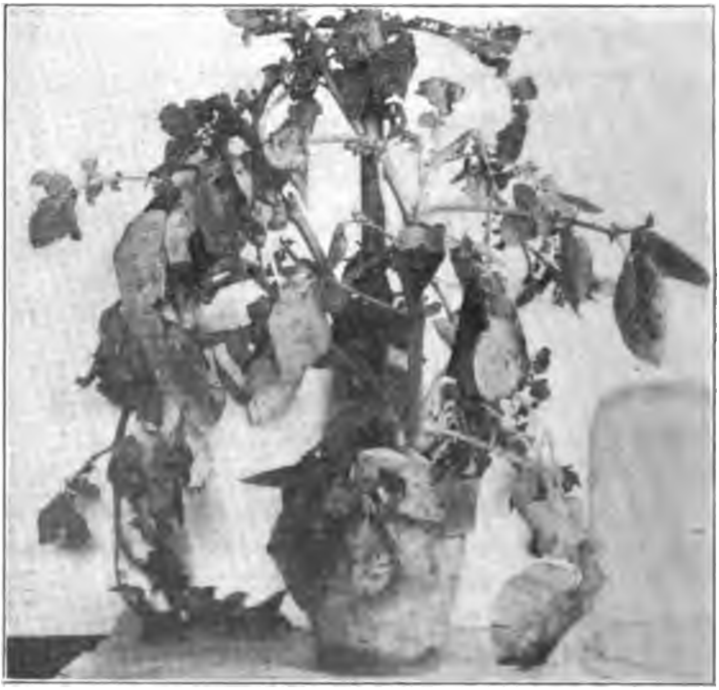

Fig. 63.—Potato plant infected with early blight. Infections were secured by inoculation in the greenhouse.

Spraying as a factor in controlling potato diseases has been developed largely in the eastern states due to the fact that late blight is destructive in that section. The losses from late blight have been so serious that there has been a tendency to minimize the importance of attacks of early potato blight. The published reports upon the control of this fungus show lack of uniformity in results. From the standpoint of the Wisconsin potato grower, then, it is important to determine what life habits of the early potato blight fungus render it either easy or difficult to control.

This fungus has been proved repeatedly to be an active disease producing agent. The characteristic diseased appearance of the potato vines may be readily produced by inoculation upon growing vines in the greenhouse. Fig. 63 shows a plant badly diseased. Fig. 64 shows the appearance of the diseased leaves more in detail. Sorauer distinguishes three classes of disease parasites: (1) absolute parasites, those attacking uninjured healthy plants; (2) partial parasites, those attacking weak and unhealthy plants; (3) wound parasites, those attacking plants which have been weakened by injury.

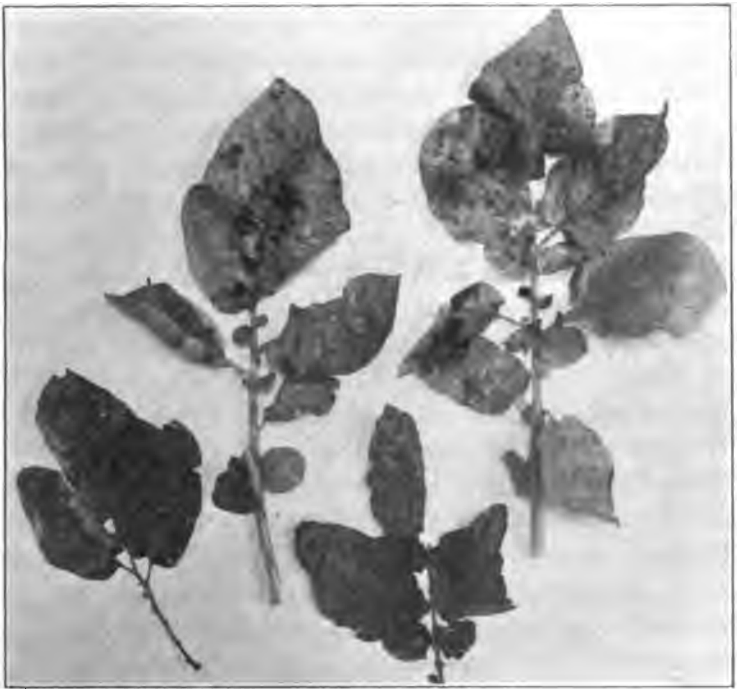

Fig. 64.—The appearance of early blight infections in detail ten days after inoculation in the greenhouse.

But this classification is not wholly applicable because of the tendency of a fungus to vary the virulence of its attack depending upon environmental conditions. The factors which suggest themselves as conditions which induce attacks of early potato blight relate largely to weather and soil, but the influence of these factors upon the growth of the vines is equally effective in modifying the nature of the fungus. It is important to keep in view the emphasis to be placed upon changing environment, which may determine the struggle between parasite and host.

Development and perpetuation of the fungus.—A fungus which is sudden and virulent in attack and rapid in development is not necessarily difficult to control. On the other hand, many destructive parasitic diseases have a hidden initial infection, a deceptive vegetative development, and a destructive fruiting stage at which time they feed upon the weakened condition of the host. The ability of the early blight fungus to lie latent in plant tissues is possible because of the fact that both the mycelium and the asexual spore stage are able to withstand extremes of heat and drought without loss of vitality or viability. Diseased potato leaves taken from the vines during July show the presence of active mycelium, but the development of the fungus is very rarely conspicuous in this State until after the middle of August.

In this connection it is timely to mention an article by Massee in a Kew. Bulletin upon "Hybernating Mycelium as a Means of Perpetuating Late Blight *(Phytophthora infestans)* and Potato Leaf Curl (*Macrosporium solani*) Cooke)."*

Massee believes that sudden virulent attacks of either disease under favorable weather conditions are due to the sudden development of dormant mycelium, and not to a rapid production of asexual spores. He further states that the dormant mycelium of early potato blight may be carried over the winter in the tubers. The writer is in possession of no data, either confirming or disproving the statements given above upon hybernating mycelium in the tubers as relating to the perpetuation of disease. However, the periodic development of dormant mycelium during the course of the season may in part explain the necessity for continued vigilence, when spraying is relied upon to hold the disease under control. Rapid spread of the diseased spots upon the potato foliage has been noticed late in the season when heavy dews and warm sunshiny days are prevalent. General infection upon growing vines in the greenhouse has been secured (Fig. 63) through artificial inoculation with spores and agar cultures. The fact that constant re-infection may take place due to the resumption in growth of dormant mycelium does not preclude a belief in what seems equally true that re-infection is continued from the germination of large numbers of the current season conidia.

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*Kew. Bul. N. S. Wales Agr. Gaz. 18, 168.

Correspondence from different sections of the country indicates that this fungus is destructive under a wide range of environment. Destructive attacks of blight have been observed by the writer under at least two contrasting conditions. These apparently indicate a wide adaptation to environment, but upon study they conform to the normal development of the fungus. For example, during the summer of 1907 early blight developed conspicuously during a dry, hot period of about ten days in August upon the light sandy soils of the State. These conditions are generally regarded as conducive to a rapid development of the disease. During the month of August of the previous season destructive attacks of blight were observed on the clay loam soils near Rio, Columbia County. The nights were cool and accompanied by heavy dews. The days were frequently hot and continued showers kept the soil steaming and soggy. The disease developed rapidly and practically destroyed the vines upon the poorly drained areas. These facts merely indicate the unreliability of general conclusions drawn from restricted and limited observations.

Influence of soil exhaustion.—Soil exhaustion is one of the surest means of lowering the vitality of a crop. It has been observed upon some of the stronger sandy loam soils of Wisconsin that, although blight may be conspicuously present upon the potato fields, the loss is not serious because the vines are resistant enough to carry the crop well into maturity. On the lighter and more bottomless sand, however, with conditions no more favorable in regard to the possibilities of infection, the disease gains rapid headway and the vines die from two to three weeks in advance of the season. Undoubtedly this condition is largely due to the mechanical and physical properties of the soil as well as to reduced fertility. Correlated with the problems of fertility precaution must be exercised in the me-

chanical handling of soils to avoid extremes o
water clogging.

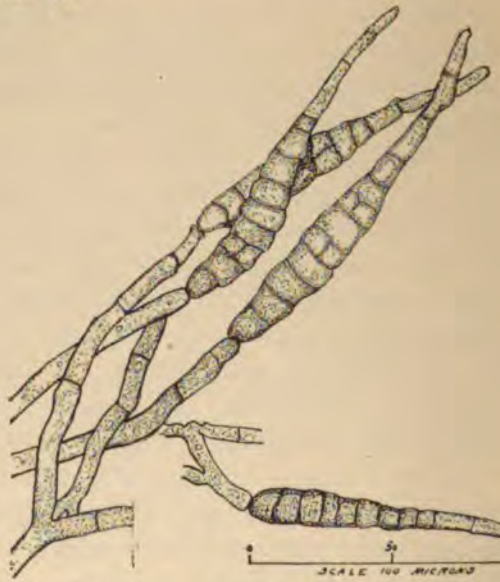


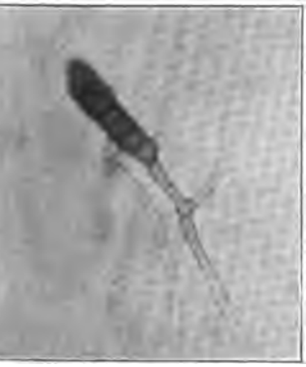
Fig. 65.—Camera lucida sketch of conidia of *Alternaria solani*
branches. Magnified 385 diameters.

Much of the best work which has been done in
ing has been in an effort to produce disease resis
Crossing resistant varieties, natural selection, a
duction of foreign varieties have been tried by the
in producing variations from which improved f
selected. However, it is well to remember that i
duction does not necessarily include disease re
the other hand, turning the energies of a plan
tion into the abnormal development of some single
doubtedly invites disease attacks in other dir
plant breeder is especially concerned in discove
disease resistance in a variety is due. Is it due
ture, chemical composition, or some internal re
which has developed during the culture history
Among the varieties of potatoes grown there are
seem inherently resistant to blight, but the sus
disease shown among many varieties is due un

ge part to such matters as mistakes in selecting and handling seed.

Morphological characters.—In addition to the factors of en-onment mentioned, the writer wishes with the aid of illus-tions to show the important morphological characters of the ngus.

Fig. 65 shows a group of conidia borne upon their fruit- branches magnified 385 diameters. The sexual or resting ge of *Alternaria solani* has never been found. The conidial ms shown, however, are able to withstand severe freezing l thawing. From the standpoint of necessity then, the ngus needs no sexual reproduction, as the conidial stage is ficient for perpetuation from season to season. The initial ection upon a plant may occur either from viable conidia or m the resumption in growth of hybernating mycelium. Fig. is a micro-photograph of a conidium growing in an agar ture.



66.—Micro-photograph of single nidium of *Alternaria solani*. Note ptate mycelium and protrusion of rminating tube.

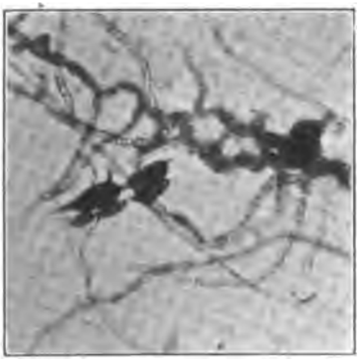


Fig. 67.—Agar culture of saprophytic species *(Alternaria fasciculata)*. Note spores in chains and septate mycelium.

The fungus is an internal parasite in that when the disease established, the mycelium is able to permeate the entire tis- of the leaf. Fig. 68 shows the mycelium of the fungus a longitudinal section of a potato leaf. In most of the cul-es obtained from field infections there was found associated aprophytic species of *Alternaria*. Fig. 67 shows an agar ure of the fungus taken by micro-photograph. The Vermont Station has conducted extensive botanical the separation of this species of *Alternaria*.*

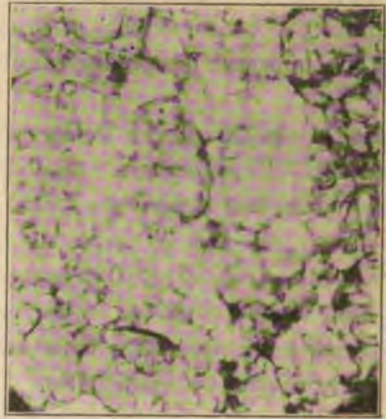


Fig. 68.—Micro-photograph of longitudinal section of potato le presence of mycelium of the early blight fungus.

Probably among the mass of farmers who economic crops even the fact of an association of life with plant diseases has just begun to be Directly then from an educational standpoint, an from an economic standpoint agricultural investi yet to teach the fundamental facts of disease in its tion to microscopic organisms. As stated in the di important economic problems in the study of a fu are suggested largely by practical questions involvin Enormous amounts of money are spent annually in States upon fungicides and spraying machinery fo of potato diseases. The economic importance of blight to the Wisconsin potato grower warrants th of a great extension of potato spraying in this Sta will depend largely upon three factors:—

1. A correct understanding of the nature and of the disease-producing organism and a clear co these facts as associated with standard methods of

2. Attention to the essentials in management i applied remedies.

3. A rational handling of the soil and selecti ties consistent with advanced agricultural practice.

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*Vt. Sta. Rpts. 9 and 10.

POTATO SPRAYING EXPERIMENTS FOR 1907.

J. G. MILWARD.

During the past season spraying experiments for the preven- ion of early potato blight have been continued along similar ines to those given in the 1906 report. The work has also een extended to include observations upon blight-resistant arieties and yield tests with three varieties of Russian alcohol otatoes imported by the United States Department of Agri- ulture. Spraying experiments were conducted at Grants- urg, Burnett County; at Hancock, Waushara County; and aupaca, in Waupaca County. The work upon blight-resist- nt varieties and commercial alcohol potatoes was confined en- irely to Waupaca County.

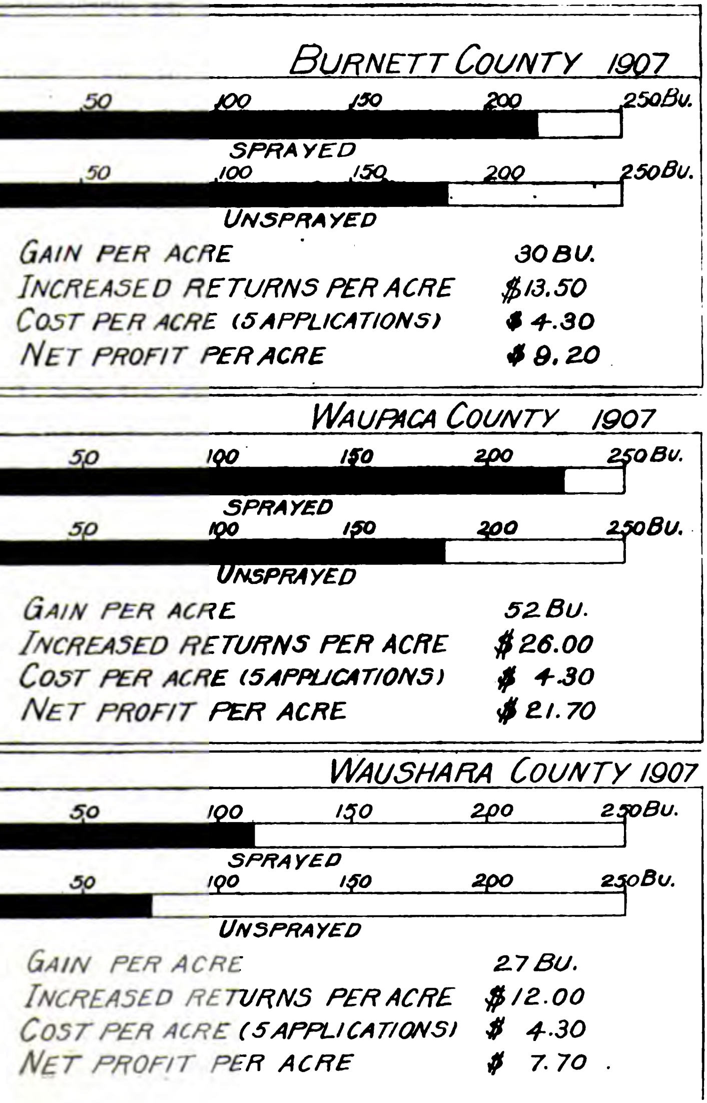
Attacks of early blight were severe enough the past season reduce the yield in the State about one-third. It was ob- erved again this season that the distribution of losses over the otato growing counties was largely determined by weather nd soil conditions. The soil conditions in regard to composi- on and fertility are so widely variable over the potato grow- g areas, that considerable importance must be attached to is one influence.

Experiments in Burnett County.—The Grantsburg experi- ent was located upon a well prepared clay loam soil. The eather conditions were suited to a rapid growth of the vines, d the blight made no headway upon the unsprayed areas un- l after September 5. Upon that date an examination of the nes showed the presence of many dense black spots upon the wer leaves. The last application of Bordeaux mixture was applied to the sprayed areas September 13. Early blight developed rapidly after September 12, and by September 16 the unsprayed areas were practically dead. The sprayed vines remained green until September 25, when unfortunately a heavy frost killed the entire field. A comparison of yields which was made a few days later showed an average increase of twenty-seven bushels per acre (15%) in favor of the sprayed areas. The experiment at Grantsburg was successful largely in that it showed how thoroughly Bordeaux mixture will keep the vines free from the early blight disease. Had it not been for the early freeze undoubtedly greater differences in yields would have resulted. Nearly a normal crop of potatoes was harvested in Burnett County this season.

Waupaca County experiment.—A departure was made from the two previous seasons' work by locating all of the potato investigations other than spraying at Waupaca. About five acres were devoted jointly to a test of disease resistance upon 110 varieties, and a trial with Russian alcohol potatoes. In addition about ten acres were sprayed with Bordeaux mixture under the regular plan adopted by the Station for field experiments.

Blight attacks in Waupaca County were induced by a drought of about ten days during the month of August. Bordeaux mixture again proved efficient in holding the disease under control upon the sprayed areas. Five applications were made during the season. Good white stock of late varieties showed an increase over the unsprayed yield ranging from thirty to forty per cent. Net profits of about $20 per acre were realized. The yield of potatoes in Waupaca County this season was not more than eighty per cent of a normal crop.

Among the 110 varieties tested, a wide variation was shown in regard to disease resistance. The fact that the seed potatoes were obtained from widely separated sources must be considered in contrasting the disease resistance of varieties. This and other cultural factors must be tested over a period of several seasons before the results will be conclusive. The potatoes tested for alcohol purposes heated to such an extent in transportation as to greatly reduce their value as seed. They



GAIN PER ACRE	30 BU.
INCREASED RETURNS PER ACRE	$13.50
COST PER ACRE (5 APPLICATIONS)	$4.30
NET PROFIT PER ACRE	$9.20

GAIN PER ACRE	52 BU.
INCREASED RETURNS PER ACRE	$26.00
COST PER ACRE (5 APPLICATIONS)	$4.30
NET PROFIT PER ACRE	$21.70

GAIN PER ACRE	27 BU.
INCREASED RETURNS PER ACRE	$12.00
COST PER ACRE (5 APPLICATIONS)	$4.30
NET PROFIT PER ACRE	$7.70

ig. 69.—Results of spraying for potato blight in 1907 on test fields.

were also found to be quite badly mixed. F
results will be withheld until further trials ar

Waushara County experiment.—Most of the
tioned in regard to the work in Waupaca Cou
Waushara County. The short period of dro
month of August hastened the development of
light sandy soil of Waushara County. The
potatoes in the county probably did not exc
bushels per acre. Sprayed areas in the vici
yielded from 100 to 110 bushels per acre, or
one-third.

Summary.—The results of the work this
mate quite closely those of the season of 190
phasis should be placed upon the selection a
potatoes as a factor in maintaining producti
in our standard varieties. The most severe lo
have been observed where the soil has been ex
continuous cropping or natural leaching. B
has proven an efficient preventive against ea
where cultural conditions are suited to the gro

It is important that a closer study be made
of weather conditions upon the prevalence of
Wisconsin. This will necessitate close obser
the records of several seasons.

INFLUENCE OF "BOTTOM HEAT" IN FORCING CUCUMBERS.

J. G. MOORE.

Since the forcing of cucumbers in greenhouses assumed com- nercial importance, more or less has been heard about the ffects of superheated soil, commonly spoken of as "bottom eat," on the growth and productiveness of plants. Whether iperheated soil does produce beneficial results is becoming a uestion of greater importance. On account of the rapid rowth of this industry and the increased cost of producing given crop, due to the advance in the price of fuel, growers vegetables out of season have been forced to utilize any ailable factors which give promise of lessening the unit cost production. Naturally one of the first factors to be tried as "bottom heat." Although it is often mentioned in articles forcing, it is almost impossible to find any data on the gree of soil temperature best adapted to give the maximum eld at the lowest unit cost of production. While the forcing dustry has not assumed extensive proportions in Wisconsin, is nevertheless one which must sooner or later attract a large imber of men, due to the high prices which are being offered r the products of the forcing house. Anticipating this owth and knowing the lack of definite knowledge concerning e problem, it was decided to carry on experiments which ould at least throw some light on the subject. It must be membered that in carrying on the work the details made it ipossible to grow the plants as they would be grown com- ercially, which would preclude making it a paying propo-

sition, but, so far as it applies to the questions unde
tion, this in no way detracts from the value of the
tained. As only those forcing crops which are class
temperature plants" are supposedly benefited by hi
perature, it was decided to use the cucumber, as it
which would be apt to show most clearly the ev
either excessive or insufficient heat.

OBJECTS.

The chief object of the experiment was to de
soil temperature best suited to the production of the
out taking into consideration the difference in cos
ing the different amounts of heat. With the main
associated several minor factors which were dete
what are best results. These factors were: (1
(2) relative number of male and female flowers, a
tive effect on growth and vigor of plants. The
experiment covered a period of three years. Ei
of plants were grown—three each in 1905 and 19
in 1907. No two benches grown during the sam
maintained at the same soil temperature. The ra
peratures from lowest to highest during the entire
from 68.7° to 83.3°F. The benches with their di
peratures were as follows: A—70.8°F; B—68.7°F
F; D—73.8°F; E—75°F; F—73.4°F; G—83.3°F
F.

It will be seen that these group themselves na
three groups. The first group is composed of be
and C, grown respectively in 1905, 1906, and 190
tention was to keep the soil temperature at about
exercising any extra precautions. Benches D, E, an
the second group, grown in their order througho
years; the temperature desired being 74°. Bench
formed the last group, being grown in 1905 and 19
at a temperature of 83.3°. The average tempera
ured from duplicate readings taken daily at 8 A.
and 5 P. M.

'he experiment in 1905 covered a period of 110 days, in)6, 173 days, and in 1907, 167 days. Owing to the fact t in 1905 greenhouse space was unavailable until very late the season, the experiment was not started until February In 1906 the date of beginning was December 4, and in 1907, cember 19. Owing to the difference in the amount of sunne during the shorter period in 1905, slightly less time was uired to bring the plants into fruiting than in the following son. Then, too, in 1907 the small percentage of actual sunne materially lessened the production of fruit. The folling are the amounts of sunshine during the periods of wth: 1905, 51.9 per cent, 750 hours; 1906, 45.2 per cent, .8 hours; 1907, 41 per cent, 634.8 hours. It will be seen t in the period of 110 days in 1905 there was a greater ount of sunshine than in the 173 days in 1906.

Benches A, D, and G were grown in 1905, B, E, and H in)6, and C and F in 1907. In 1905 limited bench space rered the number of plants grown in each bench to differ, but ring the two subsequent seasons an equal number of plants s grown on each bench. Only one row of plants occupied a ich. This was necessary because of the impossibility of keep; a correct record where the plants were grown as they would commercially. The plants were thinned from time to time til the danger from "damping off" was passed, when they re thinned to about fourteen inches apart. The soil used each case was a clayey loam containing a relatively large iount of humus incorporated by composting the soil with inure.

FERTILIZERS.

With the crop of 1905 the only fertilizer used was a layer about one inch of composted hen manure placed near the ttom of the bench. This apparently furnished sufficient plant od for the maximum growth. In 1906 and 1907 liquid ferizer was used. This fertilizer was made by placing one bush- of fresh cow manure in fifty gallons of water and allowg it to leach. After the plants had reached the flowering stage e fertilizer was applied at intervals of ten days to two weeks, about one quart being given to each plant at each application. The fertilizer was applied only after the plants had been thoroughly watered in order that no evil effects might result from their taking up too much of the plant food at once. It must be remembered that the difference in fertilization would in no wise affect the results obtained as those benches at different temperatures were always run in check.

The cucumber is a monoecious plant, that is the male and female organs are produced in different flowers on the same plant; therefore hand pollination becomes necessary in forcing this crop. As a result there is a chance for wide variations due to lack of care in performing the operation or to unfavorable weather at such times. This is noticeably so in the difference in production of fruits in 1906 and 1907, and can be largely attributed to a comparatively small amount of sunshine during the latter season. Another factor which enters into this work is that of pollinating only on alternate days. For best results in the setting of fruit we believe that this should be done daily, for then one is able to apply the pollen at the most receptive stage of the stigma. This was impossible in the experiment, however, owing to complications which would arise in the recording of the blossoms, which will be more fully explained farther on.

PRODUCTION.

In recording the production of the various benches only those fruits which reached a marketable size were taken into consideration. As mentioned before, the production in 1907 was considerably less than that for the preceding year, due to unfavorable climatic conditions. While this would affect somewhat a consideration of the fruits produced during the season, it does not affect the relative amounts of fruits produced at the different temperatures. In estimating this production, the benches kept at a temperature of 73 to 70 degrees F. were taken as a standard, or 100 per cent. The following table shows the relative production of the benches, at different temperatures, for the three years.

TABLE I.—*Relative production of various benches.*

	1905.	1906.	1907.
	Per cent.	Per cent.	Per cent.
Benches, 68-70 degrees F.	81.1	92.3	92.3
Benches, 73-75 degrees F.	100.0	100.0	100.0
Benches, 83 degrees F.	89.2	78.5	......

It will be seen by the above table that all benches kept at a temperature of 73-75 degrees produced the maximum amount of fruit, and that the benches kept at from 68-70 degrees produced on an average a greater amount than the benches kept at 83 degrees. It would appear then that the best soil temperature at which to grow cucumbers is approximately 74 degrees. This, of course, considers only production regardless of cost.

EARLINESS.

The results in earliness due to varying degrees of soil temperature were not so marked as would be naturally supposed. In the years of 1905 and 1906 there was a difference of but three days between the appearance of the first plants in the benches having a high temperature and those having a low temperature. In 1907 plants appeared on the same day in both benches. This latter fact is probably due to the absence of sunshine and its effect upon the upper surface of the soil during the germination period. The earliness of flowers shows a slightly greater variation, but in the production of the first fruits the difference is not so marked as in the appearance of the flowers. The following table shows the relative time of flowering and fruiting for each bed during the experiment:

TABLE II.—*Earliness of flowering and fruiting.*

Year.	Bench.	Temperature.	Flowering.	Fruiting.
		Degrees, F.	Days.	Days.
1905	A D G	70.8 73.8 83.3	45 40 38	78 75 75
1906	B E H	68.7 75.0 83.3	42 40 34	83 79 79
1907	C F	70.6 73.4	41 41	83 83

While the first fruits were harvested at approximately the same time, the length of the fruiting period of the plants was found to diminish with the increase in soil tmperature. Both in 1905 and 1906 the benches carried at a temperature of approximately 83 degrees ceased fruiting before the close of the experiment. Those carried at approximtely 74 degrees showed a tendency to diminish while the others at the lower temperatures were still vigorous and gave promise of production for some time to come.

RELATIVE NUMBER OF FLOWERS.

In recording the number of blossoms which were produced by the plants with the different conditions of soil temperature, two things were taken into consideration. First, the relative number of male and female flowers produced, and, second, whether the soil temperature influenced this ratio. Records were kept of all of the flowers produced by the various plants and averages made of the different benches. This was done by picking off on alternate days all staminate flowers, and at the same time pollinating all pistilate flowers. By leaving the intervening day the pistilate flowers would become sufficiently wilted so that there was little danger of recording them a second time. The picking off of the staminate flowers undoubtedly increased to some extent the number of flowers produced, but as all benches were treated exactly alike this should in no way affect the data collected in regard to the relative production of the various benches. The following table shows the average production of flowers per plant for the various years and the ratio of staminate to pistilate flowers:—

TABLE III.—*Flower production.*

Year.	Bench.	Temperature.	Total.	Pistilate.	Staminate.	Ratio.
		Degrees, F.				
1905....	A	70.8	974	42	932	1:22.1
	D	73.8	466	43	423	1: 9.8
	G	83.3	489	41	448	1:10.9
1906....	B	68.7	382	62	320	1: 5.1
	E	75.0	421	72	349	1: 4.8
	H	83.3	339	55	284	1: 5.1
1907....	C	70.6	176	16	160	1:10
	F	73.4	160	13	147	1:11.3

It will be noticed that the ratio for Bench A, 1905, is greatly in excess of the others. This is due to the fact mentioned before, that on account of lack of space only a small number of plants was grown in Bench A. Of these plants, two showed a marked tendency toward production of staminate flowers, one of which produced 1,998 during the period. It will also be seen that the number of flowers produced by Benches C and F, 1907, is much smaller than those produced on benches of like temperature during the preceding years. This is undoubtedly due to the small amount of sunlight during that season. In figuring production of flowers as influenced by soil temperature, averages were determined for the various benches. As in previous cases, benches from 73-75 degrees were taken as the standard, or 100 per cent.

TABLE IV.—*Relative number of flowers.*

Temperature of bench.	1905.		1906.		1907.	
	Pistilate.	Staminate.	Pistilate.	Staminate	Pistilate.	Staminate.
	Per cent.	Per cent	Per cent.	Per cent	Per cent	Per cent.
68-70	102	220	86	91	123	109
73-75	100	100	100	100	100	100
83	95	106	76	81	....	....

It will be seen from this table that the amount of bottom heat does not exercise any marked influence over the relative production of staminate and pistilate flowers. A comparison of the averages for 1905 and 1906 indicates that it is more a question of atmospheric conditions and temperature of the house than of soil temperature. While in 1905 both benches above and below 73 degrees produced a larger percentage of flowers than the standard, in 1906 both produced a smaller number. As in the preceding table, the percentage given for Bench A is influenced by the individuality and small number of plants. The ratio of staminate to pistilate flowers decreases with the fruit production. During the greatest fruit production it often becomes difficult to find sufficient staminate flowers for the purpose of pollination.

EFFECT ON GROWTH AND VIGOR.

The effect of superheated soil on the growth and vigor of the plants was very marked during each of the three years in which the experiment was carried on. The effect upon the various benches carried at approximately the same temperatures, however, was the same in all cases. Benches with temperatures approximating 74 and 83 degrees produced a much more rapid growth at the start than those at a temperature approximating 69. The advantage gained, however, by the early growth was not maintained throughout the entire growing period. While the plants grown at a lower temperature were slower in getting started, in every case they overtook the plants grown on the other benches, and by the time the fruiting period was reached, little or no difference could be seen in their size. The effect of the superheated soil on the vigor of the plants was much more marked. The higher the temperature the shorter was the period of production. Benches carried at a temperature of 83 degrees during both 1905 and 1906 had practically ceased fruiting by the end of the experiment, and were producing very few flowers. The plants had become sick in appearance, foliage appearing yellowish instead of the normal green color, and with the increased atmospheric temperature due to the increased amount of sunshine during the months of May and June they became much more susceptible to insect attack. The benches carried at approximately 74 degrees did not show these conditions to so marked an extent, but during the last few days indicated that their fruiting period was nearly at an end. While the plants still showed considerable vigor, they did not possess a healthy appearance, nor were the blossoms appearing upon them nearly so numerous as were those in the benches carried at a lower temperature. The benches with a soil temperature of approximately 69 degrees were apparently as vigorous as at any time during their growth and the production of flowers was only slightly less than it had been previously.

From these observations we believe that the length of fruitfulness in the cucumber is inversely proportional to the amount of soil temperature, within the limits of temperature usually given in producing this crop.

SUMMARY.

From data secured and from observations made during the three years in which this experiment was carried on, the following conclusions are drawn:—

1. That a soil temperature of approximately 74 degrees gives greater fruitfulness during the same length of time than temperatures ranging either much higher or much lower.

2. That earliness of production is increased very little, if any, by the increase in soil temperature.

3. That flower production is influenced only slightly, if any, by various degrees of soil temperature. Sunshine, atmospheric temperature, and individuality of plants are the important factors in this respect.

4. That higher soil temperature shortens the fruiting period of the plants.

5. That the advantages gained by higher soil temperature would not warrant the additional cost entailed in increasing it above that which would usually exist under ordinary forcing conditions employed in growing this crop.

6. That plants possess an individuality which has more to do with their behavior than the different treatments which would commonly be given in greenhouse operations. That this individuality shows itself in the form of plant, relative number of flowers and fruit produced, and rapidity of germination and growth. That better results can be obtained by using seed from the best individuals than by attempting to influence production by increased soil temperature.

TOBACCO INVESTIGATIONS FOR 1907.

J. G. MOORE AND A. J. ROGERS.

The tobacco work carried on by the Agricultural Experiment Station for the past year has taken into consideration distribution, breeding, experiments in curing, and fertilizer tests.

Seed distribution.—Seed distribution has followed the same line as practiced during the past two years, but has been much more extensive than ever before. Nearly three hundred pounds of seed grown under the direction of the Department of Horticulture were distributed in lots of from one to six ounces, approximately nine hundred growers receiving a sample of the seed. The object to be attained was as wide a dissemination of the seed throughout the tobacco regions of the State as possible in order that this improved type might more nearly replace the older and less valuable varieties previously grown. The call for the selected seed greatly exceeded the supply. The increase over the former demand was undoubtedly due to results which had been attained by those who had used it in producing a portion of their crop in previous years. The most important factor in disseminating a knowledge of the value of the tobacco grown from this seed was the fact that it was awarded sweepstakes at the Wisconsin Tobacco Growers' Convention held at Madison in 1907.

During the present season the work of growing selected seed for distribution has been conducted on the farms of J. C. Hooverson, Soldiers Grove, and E. M. Calkins, Janesville. The tobacco was grown from the improved strain of Wisconsin grown Connecticut-Havana seed similar to that previously distributed by the Experiment Station. It was watched closely in the field and all undesirable plants were discarded. These precautions should give an exceptionally fine grade of seed for distribution during the coming winter. As it is not the intention of the Station to continue this phase of the work beyond the present year, all growers who receive seed this year are urged to save their own seed.

Seed breeding.—The breeding work was done on the grounds of the Horticultural Department at Madison. Nine crosses which had been selected from a great many grown during the previous two years were used in this work, which consisted chiefly in selecting those plants which gave promise of producing a superior grade of tobacco. Out of approximately 1,000 plants only five were selected which were deemed worthy of use for further selection. Three of these gave indications of being superior in quality of leaf and production. The other two plants selected, while not up to the standard of the former three, were considerably better than any of the remainder. It is proposed to continue this work in the effort to still further improve the tobacco grown in the State.

Curing experiments.—The curing experiments are a continuation of those begun in 1906. The object is to control the atmospheric conditions in the curing shed with special reference to rapidity of curing and to general disease control. Two acres of tobacco were grown on the experimental ground to use in this experiment. A record of the temperature throughout the curing season was kept by the use of thermographs. Determinations of humidity were also taken twice daily. By the use of live steam and artificial heat it was attempted to keep the amount of humidity uniform. By this means it was also possible to keep in check pole rot and other diseases attacking tobacco, and also to control the rapidity of curing.

Fertilizer experiments.—Three fertilizer experiments were carried on during the past season. On the farm of E. M. Calkins, Janesville, five acres were divided into acre plots which were treated as follows: Plot I—Check; Plot II—300 pounds nitrate of soda, 2 applications, 300 pounds sulphate of potash, 2 applications, 400 pounds of bone meal; Plot III—400 pounds tton seed meal, 400 pounds bone meal, 300 pounds sulphate potash, 2 applications; Plot IV—200 pounds nitrate of soda, 0 pounds bone meal, 300 pounds sulphate of potash, 2 plications; Plot V—400 pounds of cotton seed meal, 100 unds of nitrate of soda, 400 pounds bone meal, 250 unds sulphate of potash. Where two applications were made, e was applied just before the plants were set, and the second out a month later. The land selected for this experiment was ove the average in amount of plant food which it contained d no results could be observed from the characteristic growth the plants. Owing to a very late setting and an early frost, has been impossible to get any definite results from this ex- riment.

The second experiment was conducted on the farm of S. B. ddles, Janesville. It consisted in applying 120 bushels of e to five acres and leaving a check of the same amount. The l to which this was applied was a heavy clay loam which ddled badly. There was no apparent effect upon the growth the plants. The mechanical condition of the soil, however, s somewhat improved and better results can be expected m a crop next season on the same land than during the one t past.

The third test was conducted on the farm of the Peoples' al Co., Janesville, Wisconsin. The application consisted of 00 pounds of cotton seed meal, 750 pounds of nitrate of a, 140 pounds of sulphate of potash, 1,500 pounds of bone al to a plot of five acres with a check of a like amount. The l was kept in the very best mechanical cultivation by fre- nt cultivations, and although the plants were started late, crop produced was very good. The greatest effect notice- e in the field was that of the prevalency of rust. On the ck a great deal of injury resulted from this disease, part of tobacco being so badly damaged that it did not pay to har- t it. Very little rust occurred on the fertilized plot. The son for this may be attributed to the additional amounts of nt food. The plants on the two plots made a similar growth to the time at which they began to mature. At this time amount of available plant food on the unfertilized plot had been exhausted, the plants were unable to continu ing processes and in the weakened condition becam to attacks of the rust. On the fertilized plots, wit amount of food, the plants maintained their vig able to mature without material injury from this d other important result of the fertilizer is to be f quality of the tobacco. This, of course, is largel by the amount of rust present. A safe estimat amount of tobacco suitable for binders at about t favor of that produced on the fertilized plot. T indicate the entire benefit gained because the qu binder, both as to oil content and color, is much b produced on the fertilized plots. It is not possible to give the actual results of increase in yield an cured by the application of fertilizer as the tobacc been stripped.

STATE NURSERY INSPECTION.

J. G. MOORE.

1899 a bill was passed by the State Legislature provid-
or nursery inspection in Wisconsin. The object of this
as twofold; viz, to secure protection against the importa-
nd spread of San Jose scale in the State, and to provide
nurserymen who wished to ship stock outside of the State
a certificate of inspection so that they might comply with
ws of other states regarding the importation of nursery
From 1899 until 1907 about the only nurserymen who
d for inspection were those doing an interstate business.
this law protected, in a degree, the fruit growers of the
it made it practically impossible to control the impor-
of seriously injurious pests because the greater number
rserymen doing business in Wisconsin did not have in-
on and were privileged to sell stock wherever and to
they pleased within the borders of the State. To rem-
ese defects a bill was introduced into the Legislature of
by Senator Brown of Waupaca, which was finally passed
gned by the Governor. This law known as Chapter 529,
of 1907, provides for inspection of the premises of all
y firms located and doing business within the State, and
a penalty for the shipping of stock which does not bear
thorized shipping tag.

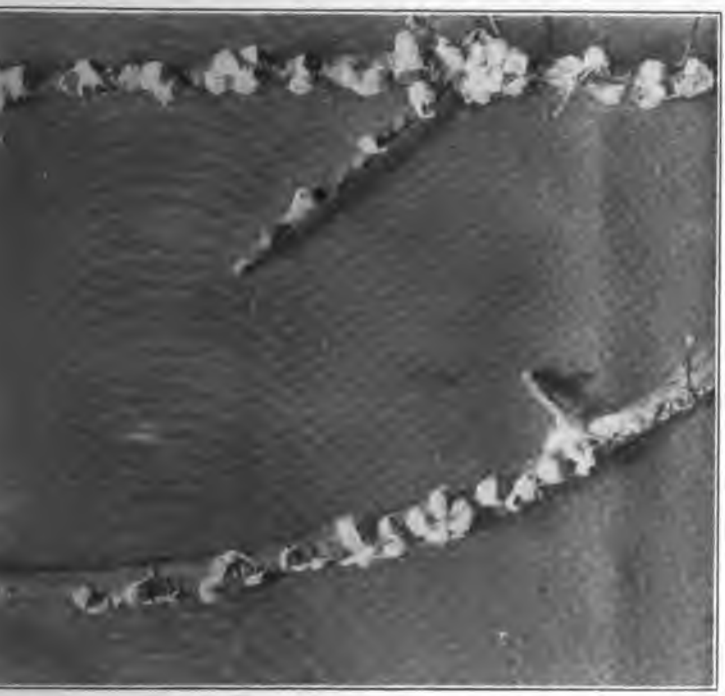
addition to compulsory inspection, the law provides for
of $5 for each ten acres or fraction thereof partially or
used in the growing of nursery stock; also that the
tor of the Experiment Station, or his agents, shall fur-

nish, upon the request of the owners of certified nur ping tags bearing a statement of inspection at a cos ceed thirty cents per hundred. These fees, with t received for shipping tags, are turned in to the S urer and placed in the general fund. The expense sery inspector is borne by an appropriation of $1,(num or portion thereof necessary to carry on the work.

The inspection is under the direction of the Dir Agricultural Experiment Station of the University sin, the inspection work being delegated to the P Horticulture. During the past year the field wor done by the writer assisted by A. J. Rogers, Jr., of ment of Horticulture.

The provisions of the new law greatly increase ber of nurseries to be inspected. Last year the firms or individuals granted certificates was thir November 1 of this year seventy-four places ha spected and granted certificates, making an incre per cent. Undoubtedly there have been some nurs have been overlooked due to the fact that the ow made application. The law provides that applica spection must be made before September 15, or t of the inspection be defrayed by the individual work done. It has been impossible to secure a c of firms or individuals doing a nursery business i but it is hoped, by the aid of the nurseries alread the list will be practically complete before the sh son opens next year. It should be borne in min rance of the law does not excuse one from the p further, that the inspector will do all in his powe the law regarding the shipping of uncertified st nurserymen who are fulfilling the requirements of materially aid in enforcing it by sending the insp of those firms or individuals in his locality who a on a nursery business.

The new conditions arising from the present la more clearly than ever the benefits to be derived



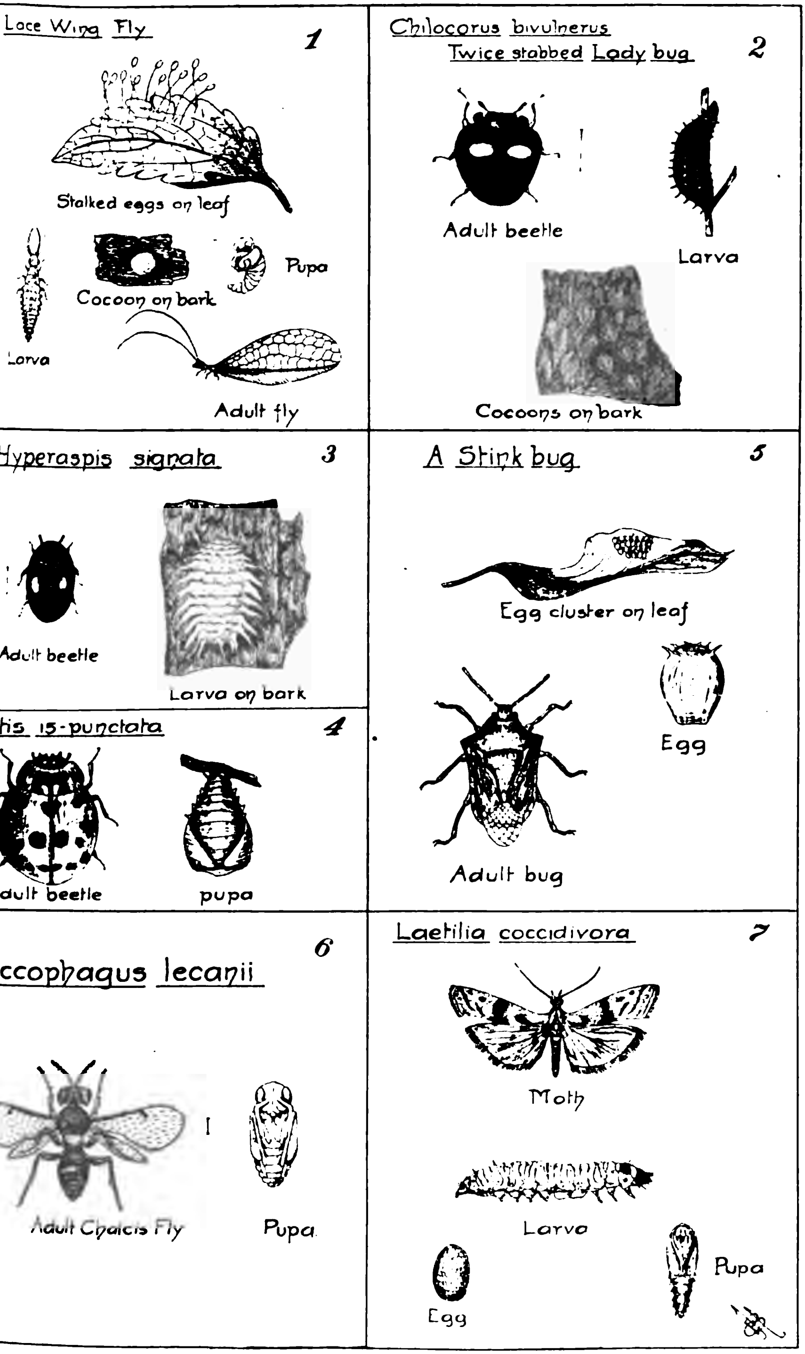
.—Cottony maple scale (Pulvinaris innumerabili) which destroyed numerous soft maples in Wisconsin.

inspection. The number of people benefited thereby will nuch greater, and the ability to cope with any rous insect or fungus will be greatly enhanced. Not r passes but that some nursery stock is destroyed because s being infected with a dangerous parasite. What has found in inspected nurseries previously, applies equally ll to those which were not inspected, and with so large crease in the number inspected there must be a propor- l decrease in the liability of widespread distribution of ious pests.

e general conditions found in the nurseries during the summer were slightly above the average. The chief com- t to be made is the great number of weeds found grow- n some of them. While the nursery law does not contain clause regarding weeds, it is to the best interests of the ryman that he keep his plantation as free from weeds as possible, at least during the early part of the season. Nursery stock demands a large supply of food material to make the desired amount of growth, and the presence of weeds tends to lessen this supply. In addition to this we find that in nurseries poorly cared for in this respect, the liability to fungous diseases and insect pests is greatly increased. Another point which is often overlooked by some nurserymen is the appearance which an excessive amount of weeds gives the premises. This is especially important to those firms doing a local business. Weeds are taken as an indication of lack of care, and the would-be purchaser does not fail to note these conditions when looking over the stock.

Of the insect pests whose presence was revealed by the inspection this year, the San Jose scale is the most important, not because of its prevalence but because of the great damage which may be done by this insect when it appears in large numbers. The insect was found in one nursery this year and the trees were immediately destroyed. Careful search failed to reveal this pest in other localities. During the inspection season, however, the presence of this insect in large numbers near Appleton was reported by the press. The Nursery Inspector and his assistant immediately investigated this report, and found that the person giving out this information had made a mistake in identifying the insect. Examination of the orchard in which the pest was supposed to exist revealed the fact that the reported insect was the oyster-shell bark-louse. The significance of this statement having been published without due consideration is greater than would at first appear. It not only has done much toward discouraging the fruit growers of the county, but also has the effect of reducing the sales made by the nurserymen in that section of the State, because no one cares to buy nursery stock from a region in which San Jose exists.

In this connection it will be well to consider the oyster-shell bark-louse. It is found in all parts of the State and there are very few orchards in which specimens of the insect cannot be found. While this insect is not considered to be especially injurious, it deserves more attention than is usually given it.



71.—Some insects largely responsible for the disappearance of the cottony maple scale: 1, Aphis lion or lace winged fly; 2, 3, and 4, Lady beetles; 5, Stink bug; 6, Chalcis fly; 7, Moth— coccid eating pyralid.

When found in large numbers, as is often the case, it does have a detrimental effect upon the trees, and if left alone ultimately causes their death. Like other insect pests of this class it seems to prefer trees which are weakened from other causes. In the nursery this is an indication that the tree should be destroyed. In the orchard, it means that the tree should be sprayed, pruned and fertilized in an attempt to overcome the conditions which have favored this pest. A prolific source of infestation of the oyster-shell bark-louse is the presence of old fruit trees in or near the nursery. These trees should always be removed.

Another insect which was found in some parts during the past season is the woolly aphis. This insect belongs to the plant lice but is materially different in its appearance from the plant lice usually observed upon trees. There are two forms —one which works on the trunks and branches, the other upon the roots. The form above ground is not particularly injurious. It is readily detected by its whitish appearance, but unless closely observed, it is often mistaken for a spider's nest. It is usually found on the trunk in an old wound or in the crotches. While the presence of the form above ground does not necessarily mean the root form is present, it is always advisable to look for the root form where the others are seen. Frequently no insects will be seen upon the trunks or branches, while the roots are entirely covered with them. There is only one satisfactory remedy, especially with small trees, when the root form appears, namely the destruction of the trees. In one nursery the Inspector destroyed over 3,000 young apple trees infested with this pest. Soil in which the insect has been found should not be used for a number of years for growing nursery stock.

The strawberry root louse is probably the most widely distributed of all the seriously injurious pests found in the State. It is a hard one to combat as it is found upon the roots and its presence is usually revealed only by careful examination. The insect seems to prefer a loam or a sandy soil, but occasionally may be seen in heavier soil. It is found, as a rule, just below the crown on the tender roots of the plant, and ap-

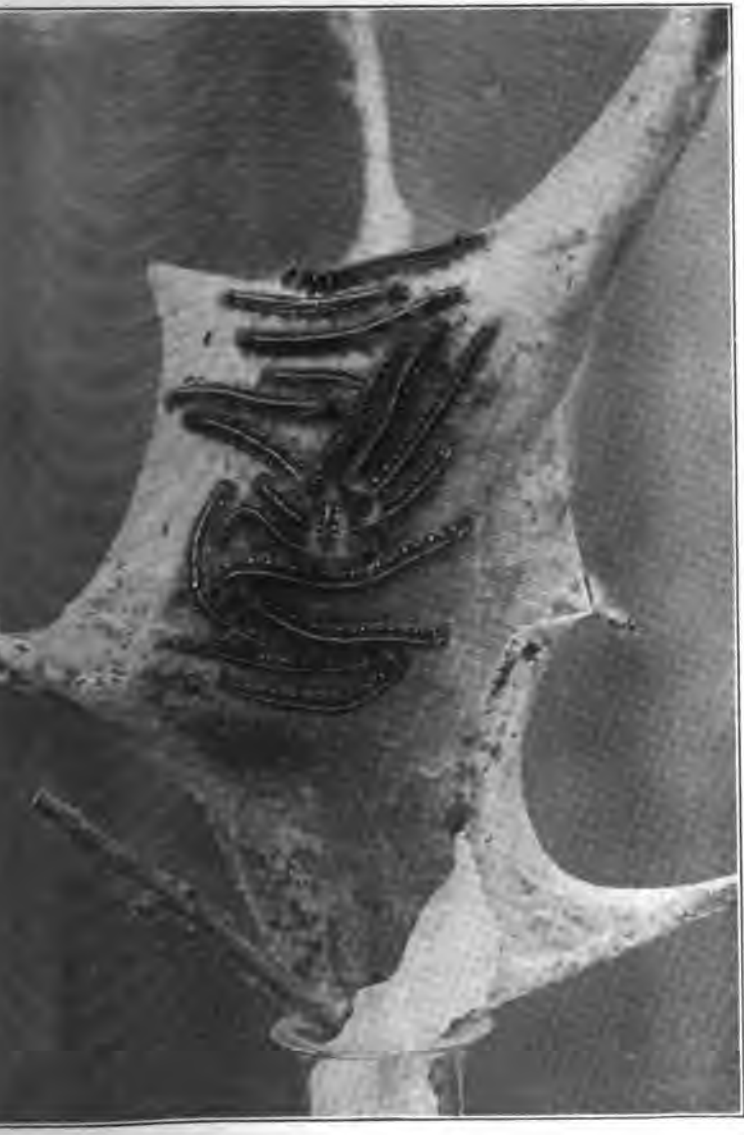


Fig. 72.— Tent caterpillar. Sometimes injurious in the nursery.

pears as a greenish or blackish plant louse quite sembling the lice found on apple trees. A comm locating the insect is by the presence of ar around the infested plants. While the burrows of base of a strawberry plant are not absolute proof t louse is present, they are of sufficient importance to cion. The control of this pest is quite difficult. by the use of hydrocyanic acid gas is one of the b This gas is extremely dangerous and should only b the greatest precaution. Carbon bisulphide may successfully. Dipping of the plants in strong toba sometimes practiced, but the great difficulty with lack of thoroughness. The decoction must come with the insect to be of value, and when hurriedl usually the case, it is not thorough or effective.

Two other insects deserve brief mention. The ple scale, so prevalent in 1905, has practically dis virtue of the vast number of parasites which pre While the damage done is very marked in some loc ing is to be feared from the insect for some ti The other insect referred to is the coxcomb gall which has caused a great deal of apprehension serymen as it is present in large numbers in va ries. Inside of the gall is to be found one or ma which are covered with flocculent material. The by this insect is not serious, being only the disfigu foliage. The fallen foliage should be destroyed in this will greatly reduce the number of galls the f son.

Of the plant diseases we wish to mention on anthracnose of the raspberry. The prevalence of throughout the State in fruit plantations has cau looked upon by nurserymen with little concern. bly the most detrimental disease commonly found ries and therefore should have close attention. be taken in propagating to select only those plan not reveal its presence. Old canes which are inf be cut out and the young ones sprayed. This spr

gin as soon as the young ones appear and continue through-
t the season.

The following table gives the list of nurseries inspected dur-
g the year, location, acreage, and the amount of fees, includ-
g cost of tags, turned in by the Nursery Inspector to the State
reasurer.

TABLE I.—*List of nurseries granted certificates.*

Firm.	Location.	Acres.	Fee.	Tags.	Total.
dger State Nursery Co.	Reedsburg	10	$5 00	$20	$5 20
ker, H. J	Fond du Lac	10	5 00	1 00	6 00
rnes, A. D	Waupaca	10	5 00	1 00	6 00
gham, D. E	Sturgeon Bay	10	5 00	35	5 35
rner, A. F	Cedarburg	10	5 00	1 00	6 00
nie View Nursery Co.	Tomah	10	5 00	35	5 35
ght, W. H	Ft. Atkinson	10	5 00	50	5 50
wn, A. D	Baraboo	10	5 00	20	5 20
wn, W. W	Hartland.	10	5 00	1 50	6 50
cade Nursery Co	Osceola	10	5 00	50	5 50
penter, L. A	Fond du Lac	10	5 00	20	5 20
ppel, F. H	Oregon	10	5 00	20	5 20
, Converse & Edwards Co	Ft. Atkinson	80	40 00	2 00	42 00
umbia County Nursery Co	Fall River	10	5 00	2 00	7 00
rie Bros	Milwaukee	10	5 00	50	5 50
wning, M. B	Milton	10	5 00	50	5 50
nis, Ira B	Evansville	10	5 00	50	5 50
ns, L. H	Sparta	10	5 00	50	5 50
rgreen Nursery Co	Sturgeon Bay	30	15 00	1 00	16 00
lner, Paul V	Chilton	10	5 00	50	5 50
nch, M. A	Waterloo	10	5 00	20	5 20
ondale, Joseph & Co	Brussels	10	5 00	20	5 20
at Northern Nursery Co	Baraboo	20	10 00	2 50	12 50
at, F. O	Chilton	10	5 00	20	5 20
ntze, E	Fond du Lac	10	5 00	1 00	6 00
chett, Geo. & Son	Sparta	10	5 00	35	5 35
ris, H. H. & Sons	Warrens	10	5 00	40	5 40
rison, W. J	Baraboo	10	5 00	50	5 50
wks Nursery Co	Wauwatosa	30	15 00	1 00	16 00
bst Bros	Sparta	10	5 00	50	5 50
witt, J. S	Waupun	10	5 00	20	5 20
ke, Geo. M	Sandusky	10	5 00	35	5 35
h, L. B	Baraboo	10	5 00	20	5 20
son, Nels P	Waupaca	10	5 00	2 00	7 00
ett, Z. K	Sparta	10	5 00	2 00	7 00
nson, Franklin	Baraboo	10	5 00	20	5 20
genson, Geo. & Son	Poysippi	10	5 00	1 00	6 00
ffman, Herman	Marshfield	10	5 00	20	5 20
logg, Geo. J. & Sons	Janesville	30	15 00	2 00	17 00
e's Sons Co., Henry	Black River Falls	30	15 00	35	15 35
erich, J. W	Sparta	10	5 00	35	5 35
k, S. B	Monroe	10	5 00	1 00	6 00
sh, H. F	Antigo	10	5 00	20	5 20
thewson, J. E.	Sheboygan	10	5 00	1 00	6 00
ham, H. S	Reedsburg	10	5 00	1 00	6 00

TABLE I.—*List of nurseries granted certificates—C*

Firm	Location.	Acres.	Fee.
McKay Nursery Co	Waterloo	10	$5 00
McMahon Bros	Arkansaw	10	5 00
Meenk, H. D	Waupun	10	5 00
Mt Pleasant Nursery Co	Corliss	20	10 00
Pearson, C. L	Baraboo	10	5 00
Peffer, Wm	Pewaukee	10	5 00
Phoenix Nursery Co	Delavan	10	5 00
Pratt, Chas. H	Marshfield	10	5 00
Rastall, Benj	Viola	10	5 00
Richter, W. A	North Milwaukee	10	5 00
Rounds, William	Baraboo	10	5 00
Salzer, John A. Seed Co	La Crosse	10	5 00
Schellenberger, C. F	North Freedom	10	5 00
Schmidt, R. O	Middleton	10	5 00
Schucht, Otto	Sheboygan	10	5 00
Schultz, H. A	Waupun	10	5 00
Shiocton Nursery Co	Shiocton	10	5 00
Stewart, J. E	Rock Elm	10	5 00
Stirdivant, Geo	Sheboygan Falls	10	5 00
Sullivan, E. W	Alma Center	10	5 00
Tamblingson, A. F. & Sons	Ft. Atkinson	20	10 00
Toole Bros	Baraboo	10	5 00
Toole, William	Baraboo	10	5 00
Uecke, Chas. F.	New London	10	5 00
Whelan Bros	Watertown	10	5 00
White Elm Nursery Co	Watertown	20	10 00
Wisconsin Nurseries	Union Grove	10	5 00
Wood, John F	Twin Bluffs	10	5 00
Yahr, Solon	West Bend	10	5 00

E RELATION OF ORCHARD COVER CROPS TO SOIL MOISTURE AND SOIL FREEZING.

E. J. DELWICHE AND J. G. MOORE.

uccess in fruit growing in Wisconsin, as in most states of
Middle West, is dependent upon a number of peculiar soil
climatic conditions. These conditions, though similar in
y respects to those existing in the Eastern, Southern, and
hwestern states, are strikingly different in several points
Visconsin. The soil, the distribution of rainfall, and the
perature tend to produce a quick-maturing but short-lived
. The trees, however, bear fruit early, and are very pro-
They grow shallow-rooted and consequently are apt to
r from a lack of water during cold, dry winters, such as
occur in this section of the country. For this reason
preservation of the moisture precipitated in late fall and
winter is of the utmost importance. On the other hand,
consin is noted for warm fall weather, and when this is
npanied by an abundance of moisture in August and Sep-
er a tender succulent growth results, which is unable to
re a severe winter. This is especially noticeable in the
of cherry and plum trees, and not uncommon with apple
. Hence, some means needs to be devised to check this
growth, yet leave the soil in shape to hold the moisture
falls later in the season after the trees have ceased to grow.
another factor, that of frost, has to be considered, and
sort of mulch is necessary to keep the ground from freez-
to an excessive depth. This is especially necessary in the
of cold, dry winters with little early snowfall. Under

such conditions, if the soil is bare and without cover, evaporation takes place rapidly, frost works downward very fast, and root-killing results. To prevent this, cover crops have come into general use in commercial orchards.

Cover crops not only prevent deep freezing, but also help to ripen the wood growth in late summer by cutting off a part of the moisture and plant food from the trees. Such crops also increase the amount of humus in the soil and in this way help it to retain the moisture that falls late in the fall and early in the winter. By keeping the ground covered evaporation is lessened at the surface, which is often considerable during November and December when the ground is bare.

Another important function of a cover crop is the holding of snow by preventing its being blown away by the wind. Cover crops serve also to prevent washing and erosion in the fall and early spring. In hillside orchards this alone demands the use of some such growth.

To sum up, cover crops are used:—

(a) To prevent deep freezing of the ground and thus avoid root-killing of the trees.

(b) To hasten the ripening of late wood growth, and in a measure prevent top-killing.

(c) To prevent the soil from being washed away by heavy fall and spring rains.

(d) To hold soluble plant food in the soil, especially nitrates.

(e) To lessen evaporation in winter when no snow is on the ground.

(f) To add humus to the soil so as to increase its water holding capacity.

(g) To prevent snow from being blown away.

(h) To supply nitrogen to the soil.

To test the relative efficiency of different kinds of cover crops for some of the most important points mentioned above, and the adaptability of such crops to Wisconsin conditions experiments were carried on by the writer on the horticultural grounds.

The outline of the work was as follows:—

1. To study the habits of growth of each crop in regard to:—
   - (a) Ease in getting a catch.
   - (b) Rapidity of growth and consequent earliness or lateness of cover.
   - (c) Resistance to drought.
   - (d) Resistance to shade.
   - (e) Resistance to insects and fungous diseases.
   - (f) Resistance to tramping when the fruit is gathered.
   - (g) Resistance to frost in fall and winter.
2. To determine the relative efficiency of the different cover crops in lowering the moisture content of the soil in early fall so as to hasten the ripening of the wood growth of fruit trees.
3. To determine the relative efficiency in holding soil moisture during winter months and thus preventing injury to fruit trees by too great evaporation during cold, dry weather.
4. To determine the relative efficiency of the different crops in holding snow.
5. To determine the efficiency of each crop in preventing deep freezing.
6. To observe the condition of the soil in spring relative to moisture, mellowness, tilth, and general working condition.
7. To determine the cost of each crop.

Ten different crops were used in the experiments and five combinations of two different crops. The crops and combinations used were as follows: cow-pea, soy bean, crimson clover, hairy vetch, Canada field pea, oats, rye, millet, and rape for single crops; and oats and peas, turnip and rye, oats and crimson clover, cow-peas and crimson clover, and hairy vetch and Canada peas for combinations.

The results of the different observations and determinations made are given in the following tables:—

TABLE I.—*Rate of growth of the different crops from August 25 to October 2.*

Crop.	August 25.	September 3.	September 15.	September 23.	October 2.
	In.	In.	In.	In.	In.
Cow peas	4.5	10.0	12.0	14.0	20.0
Soy beans	4.5	8.0	13.0	14.5	22.0
Crimson clover	2.5	3.0	3.5	4.0	6.0
Hairy vetch	4.0	4.5	5.0	5.5	8.0
Oats	6.0	11.0	16.0	18.0	24.0
Canada peas	5.0	8.0	13.0	20.0	24.0
Rye	5.5	8.0	9.0	10.0	12.0
Rape	2.5	4.0	10.0	14.0	16.0
Turnip	2.5	4.0	7.0	8.0	12.0
Millet	3.0	5.0	11.0	12.0	18.0

It will be seen from this table that oats and Canada peas made the greatest growth, while crimson clover and hairy vetch made the least. As suppliers of humus it would appear that the former two crops were more beneficial than any of the others tried in the experiment. Oats excelled peas in that it made better growth during the early part of the season, which is desirable in a good cover crop. The peas, however, excelled in the amount of plant food which was added to the soil, as this crop belongs to the nitrogen-supplying crops while oats does not.

TABLE II.—*Per cent of soil moisture for each crop from November 1, 1905, to February 17, 1906, and the average for three determinations.*

Crops.	PER CENT OF MOISTURE IN SOIL TO THE DEPTH OF THIRTY INCHES.			
	November 21-22, 1905.	January 2-3, 1906.	February 16-17, 1906.	Average.
Cow peas	17.7	24.5	21.9	21.7
Soy beans	18.9	23.2	23.4	21.9
Crimson clover	18.6	23.7	23.4	21.9
Hairy vetch	17.4	24.6	20.5	20.8
Oats	17.0	22.7	21.2	20.3
Canada peas	17.7	21.4	18.8	19.3
Oats and Canada peas	16.7	25.5	22.0	21.1
Rye	16.5	22.5	21.7	20.2
Check	16.2	22.4	20.4	19.7
Millet	16.1	23.4	20.6	20.0
Rape	16.5	24.0	21.7	20.7
Turnip	16.3	....	19.3	....
Turnip and rye	15.8	....	22.5	....
Hairy vetch and Canada peas	17.3	....	19.2	....
Oats and crimson clover	17.6	....	20.0	....
Cow peas and crimson clover	18.1	....	26.7	....
Average	17.1	23.5	21.5	20.7

The season in which this experiment was carried on was comparatively dry, and for this reason the differences shown in soil moisture are comparatively slight. In the data above given it will be seen that crimson clover retained the most moisture during the winter months, followed closely by soy beans and cow peas. Only one crop fell below the amount held by the check, namely Canada peas, having an average of 0.4 per cent lower.

TABLE III.—*Percentage of moisture in the soil April 7, 1907.*

Crops.	PERCENTAGE OF MOISTURE TO DRY BASIS.			
	0-6 inches.	6-18 inches.	18-30 inches.	Average.
Cow peas	21.3	19.0	20.8	20.4
Soy bean	25.4	21.9	24.7	24.0
Crimson clover	27.4	19.4	19.3	22.0
Hairy vetch	24.7	20.1	18.7	21.2
Oats	24.7	18.5	17.3	20.2
Canada peas	24.2	18.2	17.4	19.9
Oats and cow peas	22.2	18.2	19.2	19.5
Rye	22.3	18.8	16.2	19.3
Check	22.7	18.9	16.9	19.5
Millet	23.6	....	17.8	20.7
Rape	29.7	18.9	15.2	21.3
Turnip	22.5	23.4	16.3	21.2
Turnip and rye	21.7	17.0	14.6	21.1
Hairy vetch and Canada peas	21.8	20.8	16.7	19.8
Oats and crimson clover	22.4	19.6	18.2	20.1
Cow peas and crimson clover	22.5	19.3	18.9	20.2
Average	23.8	18.1	18.7	20.6
Average to 30 in all crops				20.6

This table shows that crimson clover held the most moisture in the first six inches of soil at the date of this determination, but that the moisture content of the soil below this point was much lower than with some of the other crops. Soy beans, which held 25.4 per cent in the first six inches, held 2.5 more moisture in the next foot and 5.4 per cent more moisture between eighteen and thirty inches than did the clover. Rape retained the most moisture in the first six inches of the soil, turnips in the layer between six and eighteen inches, and soy beans between eighteen and thirty inches. Soy beans have the highest average, twenty-four per cent; the next highest is crimson clover with twenty-two per cent. The peas are the best of the single crops, oats second, and between these a combination of oats and Canada peas. It will be seen that hairy vetch held practically the same amount of snow that was found on the check. The effects on freezing show that ability to hold snow is not the only factor in connection with cover crops which is instrumental in preventing deep freezing. While the hairy vetch averaged only 0.1 inch more snow than the check, yet the latter froze 11.5 inches deeper than the former. Although having the least snow holding capacity, the depth of freezing is only less in three instances than with the hairy vetch. With the soy bean the greatest depth was ten inches, cow peas and millet eleven, while with the vetch the maximum depth was twelve inches. Here again it will be seen that an average does not represent the true value of the crop.

SUMMARY.

I. Under habits of growth the following conclusions are drawn:—

1. As to ease in getting a catch, the crops stand as follows: *first*, oats, rape, rye, and millet; *second*, cow peas, turnip, and Canada field peas; *third*, soy bean, crimson clover, and hairy vetch.

2. As to relative value in obtaining an early cover, the crops rank in the following order: cow peas, soy bean, oats, Canada field peas, rape, rye, millet, turnip, hairy vetch, and crimson clover.

3. The different crops stand drought in the following order: cow peas, oats, soy bean, hairy vetch, rape, crimson clover, Canada field peas, rye, turnip, and millet.

4. As to the resistance to shade, they stand: field peas, oats, crimson clover, hairy vetch, cow peas, rye, rape, millet, and turnip.

5. The different crops tried resist the attacks of fungi in order as follows: first, soy bean, cow peas, crimson clover, rape, and turnip; second, oats, rye, and field peas; third, hairy vetch and millet. As to their immunity from insect attacks, the order is as follows: cow peas, soy bean, crimson clover, hairy vetch, oats, turnip, millet, rye, field peas, and rape.

6. The crops stand tramping in the following order: hairy vetch, crimson clover, oats, millet, soy bean, cow peas, and turnip. Succulent crops stand the least tramping.

7. As to their resistance to frost, the crops stand as follows: rye, crimson clover, hairy vetch, rape, turnip, oats, field peas, millet, soy bean, and cow peas. Rye is the hardiest crop, no winter killing being observed. Crimson clover and hairy vetch are about equal in hardiness, approximately sixty per cent of the plants surviving the winter.

II. As to efficiency in lowering the moisture content in late summer and early fall, the crops stand in order as follows: turnip, oats, field peas, Canada field peas, rye, rape, and soy bean, uncultivated bare ground, millet, oats, hairy vetch, crimson clover, cow peas. No great difference was found between the various crops; this was evidently due to the extreme drought.

III. The average of the moisture determinations made during the winter months places the crops in the following order as to their efficiency in holding soil moisture: crimson clover, soy bean, cow peas, oats, and field peas, hairy vetch, rape, oats, rye, millet, no crop, and field peas. A good cover increases the water holding capacity in a decided manner.

IV. As to the efficiency in holding snow, the crops come in the following order: Canada peas, oats and Canada peas, oats, rye, millet, cow peas, soy bean, crimson clover, hairy vetch, and rape.

V. No choice can well be made between the different cover crops as to protection against deep freezing of the ground. A cover crop decreases the depth of freezing by at least one-half.

VI. The moisture determination made in the spring, in general confirms the results obtained in the fall and winter, in that it shows the average moisture content of the covered ground to be considerably more than that of the bare ground.

EXPERIMENTS WITH GRAINS AND FORAGE PLANTS, 1907.

R. A. MOORE AND A. L. STONE.

A large part of the work of 1907 with grains and forage plants was a continuation of the cooperative tests started in previous years with the United States Department of Agriculture. Many new varieties of cereals and grasses were introduced for the first time and comparative tests made to determine their value under our conditions of soil and climate.

Twenty-four varieties of oats, twenty-seven of barley, four of winter wheat, six of rye, and one of buckwheat were tested to determine their desirable characteristics, the data of which are given on pages 388–389.

The yields of all spring grains were low, as will be noted in the table. The spring was cold and wet and seeding did not begin until late. The seed lay dormant in the ground for a time and after it sprouted the plants were retarded in their growth by continued cold weather. This cold spell was succeeded by a period of extremely hot weather. This produced a rapid succulent growth in spring grains but hastened the ripening period of winter grains which were already well started.

The extreme heat following a prolonged cold period caused some physiological changes more or less detrimental to the plants of spring grains and this in conjunction with the work of the green aphis *(Toxoptera graminum)* and rust, reduced the yield. This applies to oats especially, although barley was also affected. It is noticeable, however, that the pedigreed varieties of barley have excelled in yield the com-varieties except this variety grown on the fourteen acre l, which gave a yield of forty-eight bushels per acre. How-, no attempt was made to secure a high yield from the pedid varieties as the supply of seed was insufficient to sow at usual rate. The barley was sown thin so as to secure a np berry. A test for yield will be made with the pedigreed eys in 1908.

he Sixty Day and Kherson oats gave the largest yields. se two varieties are exceptionally early and escape the st attacks of rust, which accounts for the larger yields. The nette, a black oat, obtained from the Experiment Farm at wa, Canada, did exceptionally well, giving the highest ber of bushels per acre of any variety on trial. Further erimentation may prove this to be a good oat for Wiscon-

ood yields of winter ryes and wheats were obtained, as they too far advanced to be seriously affected by the green s or attacks of rust. The ryes all did well, the two Minne- varieties excelling in point of yield.

he four varieties of winter wheat did well, and gave yields ely approximating one another, and high for Wisconsin.

OATS.

wenty-four one-twentieth acre plots of oats, and five inse plots of pedigreed oats were grown by the Station.

his department is attempting to breed, or to secure from e outside source, a variety of oats which will stand up and luce good crops on our low and rich soils. Definite work g this line was begun this season by the introduction of varieties from the Dominion Experiment Farm, Ottawa, ada, five varieties from Garton Brothers, England, and varieties from other sources.

is desired also to secure varieties which will be either rust tant or which will ripen early enough to escape the worst cks of rust. This is being done by selection in the breeding s and by importation of early varieties like the Sixty-Day Kherson oats.

TABLE I.—*Yield of grain and straw in variety test of cereals, 1907.*

Name of variety.	Wisconsin number	Origin of seed.	When received.	Area of plot.	Seed per acre.	Days maturing.	YIELD PER ACRE.		Weight per measured bushel.
							Grain (by wt.).	Straw.	
Barley.			year.	Acres.	Bu.—Pk.		Bushels	Tons.	Pounds.
Silver King	3	John A. Salzer Seed Co., La Crosse	1900	One-twentieth	1—2	94	29.5	2.16	42
Golden Queen	11	Minnesota Experiment station	1890	One-twentieth	1—2	94	3.2	2.18	40
Primus	24	U. S. Dept. of Agr.* 10586	1904	One-twentieth	1—2	104	4.1	1.70	45
Franken	33	Wahl, Henius Institute, Chicago	1905	One-twentieth	1—2	104	10.8	1.79	40
Oderbrucker	55	Ontario, Canada	1890	One-twentieth	1—2	94	32.7	1.72	40
Manshury	62	Germany	1871	One-twentieth	1—2	04	25.4	1.94	40
U. S. No. 10361	74	U. S. Dept. of Agriculture	1905	One-twentieth	1—2	104	3.7	2.18	36
U. S. No. 10363.	75	U. S. Dept. of Agriculture	1905	One-twentieth	1—2	104	1.1	1.85	41
Odessa	77	Ottawa, Canada	1906	One-twentieth	1—2	94	10.8	2.49	39
Royal	78	Ottawa, Canada	1906	One-twentieth	1—2	94	14.1	2.56	39
Mensury	76	Ottawa, Canada.	1906	One-twentieth	1—2	94	27.5	2.14	38
Golden Queen	1	Wisconsin Pedigreed	1906	One-tenth	1—2	94	15.0	1.28	41
Golden Queen	2	Wisconsin Pedigreed	1906	One-tenth	1—2	94	19.5	1.37	36
Golden Queen	3	Wisconsin Pedigreed	1906	One-tenth	1—2	94	25.0	1.60	38
Golden Queen	4	Wisconsin Pedigreed	1906	One-tenth	1—2	94	10r8	1.17	41
Oderbrucker	5	Wisconsin Pedigreed	1906	One-tenth	1—2	94	27.9	1.79	42
Oderbrucker	6	Wisconsin Pedigreed	1906	One-tenth	1—2	94	28.2	1.76	40
Oderbrucker	7	Wisconsin Pedigreed	1906	One-tenth	1—2	99	30.6	1.79	42
Oderbrucker	8	Wisconsin Pedigreed	1906	One-tenth	1—2	94	30.4	1.76	42
Manshury	9	Wisconsin Pedigreed	1906	One-tenth	1—2	91	29.3	1.81	38
Manshury	10	Wisconsin Pedigreed	1906	One-tenth	1—2	91	29.5	1.80	38
Manshury	11	Wisconsin Pedigreed	1906	One-tenth	1—2	91	24.8	1.61	43
Manshury	12	Wisconsin Pedigreed	1906	One-tenth	1—2	91	27.0	1.69	40
Silver King	13	Wisconsin Pedigreed	1906	One-tenth	1—2	94	28.6	1.70	40
Silver King	14	Wisconsin Pedigreed	1906	One-tenth	1—2	104	27.5	1.68	40

Danish	42	U. S. Dept. Agr. No. [illegible]	1905	One-twentieth	2—2	[illegible]	[illegible]	[illegible]	[illegible]
Sparrowbill	44	U. S. Dept. Agr. No. 12,879	1905	One-twentieth	2—2	106	7.5	1.26	21
White Tartar	46	U. S. Dept. Agr. No. 12,881	1905	One-twentieth	2—2	109	13 7	1.08	26
White Russian	48	Ripon, Wisconsin	1905	One-twentieth	2—2	109	17.5	1.62	26
Kherson	49	Nebraska Exp. Station	1906	One-twentieth	2—2	92	33.7	1.16	24
Northrup, King & Co.	50	Northrup, King & Co., Minneapolis, Minn.	1906	One-twentieth	2—2	106	15.6	1.15	21
Twentieth Century	51	Dominion Exp. Farm, Ottawa, Canada	1906	One-twentieth	2—2	106	7.5	1.03	20
Golden Fleece	52	Dominion Exp. Farm, Ottawa, Canada	1906	One-twentieth	2—2	106	10.6	1.85	21
Abbott	53	W. A. Toole, Baraboo, Wis.	1905	One-twentieth	2—2	104	12.5	1.15	27
Daubenney	54	Dominion Exp. Farm, Ottawa, Canada	1907	One-fortieth	2—2	99	13.7	.84	23
Siberian II	55	Dominion Exp. Farm, Ottawa, Canada	1967	One-fortieth	2—2	108	27.5	1.41	24
Joannette	56	Dominion Exp. Farm, Ottawa, Canada	1907	One-fortieth	2—2	99	35.0	1.20	30
Bussey	59	Fred A. Bussey, Sparta	1907	One-twentieth	2—2	106	18.7	1.30	25
Storm King	64	....	1907	One-eightieth	2—2	106	27.5	1.16	24
Rye.									
Petkus	2	U. S. Dept. Agr. No. 5058	1900	One-twentieth	1—3	....	35.7	2.46	52
Schlansted	3	U. S. Dept. Agr. No. 5031	1900	One-twentieth	1—3	....	32 8	2.40	53
Minnesota No. 1	4	Minnesota Exp. Station	1902	One-twentieth	1—3	....	41.4	2.16	52
Minnesota No. 2	5	Minnesota Exp. Station	1902	One twentieth	1—3	....	42.5	2.20	55
Ivanoff	7	U. S. Dept. Agr. No. 10367	1904	One-twentieth	1—3	....	40.3	2.32	53
Olds Mammoth Spring	....	L. L. Olds Seed Co	1906	One-twentieth	2—0	....	20.7	1.21	53
Winter Wheat.									
Beloglina	6	U. S. Dept. Agr. No. 7787	1902	One-twentieth	1—3	....	25.0	2.07	59
Minnesota No. 695	8	Minnesota Exp. Station	1902	One-twentieth	1—3	....	26.6	1.98	56
Minnesota No. 550	13	Minnesota Exp. Station	1902	One-twentieth	1—3	....	25.0	1.86	58
Iowa	16	Iowa Exp. Station	1903	One-twentieth	1—3	....	28.3	2.13	59
Emmer	....	L. L. Olds Seed Co	1906	One twentieth	2—0	....	9.2	1.18	23
Buckwheat	1	L. L. Olds Seed Co	1906	....	....	....	....	....	....

TABLE I.—*Yield of grain and straw in variety test of cereals, 1907.*

Name of variety.	Wisconsin number	Origin of seed.	When received.	Area of plot.	Seed per acre.	Days maturing.	YIELD PER ACRE.		Weight per measured bushel.
							Grain (by wt.).	Straw.	
Barley.			year.	Acres.	Bu.—Pk.		Bushels	Tons.	Pounds.
Silver King	3	John A. Salzer Seed Co., La Crosse	1900	One-twentieth	1—2	94	29.5	2.16	42
Golden Queen	11	Minnesota Experiment station	1890	One-twentieth	1—2	94	3.2	2.18	40
Primus	24	U. S. Dept. of Agr.* 10586	1904	One-twentieth	1—2	104	4.1	1.70	45
Franken	33	Wahl, Henius Institute, Chicago	1905	One-twentieth	1—2	104	10.8	1.79	40
Oderbrucker	55	Ontario, Canada	1890	One-twentieth	1—2	94	32.7	1.72	40
Manshury	62	Germany	1871	One-twentieth	1—2	04	25.4	1.94	40
U. S. No. 10361	74	U. S. Dept. of Agriculture	1905	One-twentieth	1—2	104	3.7	2.18	36
U. S. No. 10363	75	U. S. Dept. of Agriculture	1905	One-twentieth	1—2	104	4.1	1.85	41
Odessa	77	Ottawa, Canada	1906	One-twentieth	1—2	94	10.8	2.49	39
Royal	78	Ottawa, Canada	1906	One-twentieth	1—2	94	14.1	2.56	39
Mensury	76	Ottawa, Canada	1906	One-twentieth	1—2	94	27.5	2.14	38
Golden Queen	1	Wisconsin Pedigreed	1906	One-tenth	1—2	94	15.0	1.28	41
Golden Queen	2	Wisconsin Pedigreed	1906	One-tenth	1—2	94	19.5	1.37	36
Golden Queen	3	Wisconsin Pedigreed	1906	One-tenth	1—2	94	25.0	1.60	38
Golden Queen	4	Wisconsin Pedigreed	1906	One-tenth	1—2	94	10r8	1.17	41
Oderbrucker	5	Wisconsin Pedigreed	1906	One-tenth	1—2	94	27.9	1.79	42
Oderbrucker	6	Wisconsin Pedigreed	1906	One-tenth	1—2	94	28.2	1.76	40
Oderbrucker	7	Wisconsin Pedigreed	1906	One-tenth	1—2	99	30.6	1.79	42
Oderbrucker	8	Wisconsin Pedigreed	1906	One-tenth	1—2	94	30.4	1.76	42
Manshury	9	Wisconsin Pedigreed	1906	One-tenth	1—2	91	29.3	1.81	38
Manshury	10	Wisconsin Pedigreed	1906	One-tenth	1—2	91	29.5	1.80	38
Manshury	11	Wisconsin Pedigreed	1906	One-tenth	1—2	91	24.8	1.61	43
Manshury	12	Wisconsin Pedigreed	1906	One-tenth	1—2	91	27.0	1.69	40
Silver King	13	Wisconsin Pedigreed	1906	One-tenth	1—2	94	28.6	1.70	40
Silver King	14	Wisconsin Pedigreed	1906	One-tenth	1—2	104	27.5	1.68	40

Wisconsin Wonder	[illegible]	[illegible] County, Wis.	[illegible]	One-twentieth	2—2	106	[illegible]	[illegible]	[illegible]
Belyak	40	U. S. Dept. Agr. No. 10,624	1904	One-twentieth	2—2	106	13.1	1.59	24
Sixty Day	41	U. S. Dept. Agr. No. 12,303	1905	One-twentieth	2—2	92	28.0	1.30	23
Danish	42	U. S. Dept. Agr. No. 12,877	1905	One-twentieth	2—2	106	11.2	1.27	23
Sparrowbill	44	U. S. Dept. Agr. No. 12,879	1905	One-twentieth	2—2	106	7.5	1.28	21
White Tartar	46	U. S. Dept. Agr. No. 12,881	1905	One-twentieth	2—2	109	13.7	1.08	26
White Russian	48	Ripon, Wisconsin	1905	One-twentieth	2—2	109	17.5	1.62	26
Kherson	49	Nebraska Exp. Station	1906	One-twentieth	2—2	92	33.7	1.16	24
Northrup, King & Co.	50	Northrup, King & Co., Minneapolis, Minn.	1906	One-twentieth	2—2	106	15.6	1.15	21
Twentieth Century	51	Dominion Exp. Farm, Ottawa, Canada	1906	One-twentieth	2—2	106	7.5	1.03	20
Golden Fleece	52	Dominion Exp. Farm, Ottawa, Canada	1906	One-twentieth	2—2	106	10.6	1.83	21
Abbott	53	W. A. Toole, Baraboo, Wis.	1905	One-twentieth	2—2	104	12.5	1.15	27
Daubenney	54	Dominion Exp. Farm, Ottawa, Canada	1907	One-fortieth	2—2	99	13.7	.84	23
Siberian II	55	Dominion Exp. Farm, Ottawa, Canada	1907	One-fortieth	2—2	108	27.5	1.41	24
Joannette	56	Dominion Exp. Farm, Ottawa, Canada	1907	One-fortieth	2—2	99	35.0	1.20	30
Bussey	59	Fred A. Bussey, Sparta	1907	One-twentieth	2—2	106	18.7	1.30	25
Storm King	64	....	1907	One-eightieth	2—2	106	27.5	1.16	24
Rye.									
Petkus	2	U. S. Dept. Agr. No. 5058	1900	One-twentieth	1—3	....	35.7	2.46	52
Schlansted	3	U. S. Dept. Agr. No. 5031	1900	One-twentieth	1—3	....	32.8	2.40	53
Minnesota No. 1	4	Minnesota Exp. Station	1902	One-twentieth	1—3	....	41.4	2.16	52
Minnesota No. 2	5	Minnesota Exp. Station	1902	One twentieth	1—3	....	42.5	2.20	55
Ivanoff	7	U. S. Dept. Agr. No. 10367	1904	One-twentieth	1—3	....	40.3	2.32	53
Olds Mammoth Spring	....	L. L. Olds Seed Co	1906	One-twentieth	2—0	....	20.7	1.21	53
Winter Wheat.									
Beloglina	6	U. S. Dept. Agr. No. 7787	1902	One-twentieth	1—3	....	25.0	2.07	59
Minnesota No. 695	8	Minnesota Exp. Station	1902	One-twentieth	1—3	....	26.6	1.98	56
Minnesota No. 550	13	Minnesota Exp. Station	1902	One-twentieth	1—3	....	25.0	1.86	58
Iowa	16	Iowa Exp. Station	1903	One-twentieth	1—3	....	28.3	2.13	59
Emmer	....	L. L. Olds Seed Co	1906	One twentieth	2—0	....	9.2	1.18	23
Buckwheat	1	L. L. Olds Seed Co	1906	....	....	....	....	....	....

BARLEY.

The State of Wisconsin grows annually approximately thirty million bushels of barley, a part of which is sold upon the market as a ready money crop, either for feeding or malting purposes. Many varieties of barley of poor grade and quality are now being grown by our farmers. The Experiment Station has put forth much effort to correct the evil wrought by growing so many scrub varieties of barley. This has been accomplished by disseminating the select strains of barley bred by the Station. The Oderbrucker and Manshury seemed to respond most readily to the attention given them and soon led other varieties in yield and other desirable characteristics. These two varieties are now most generally grown throughout Wisconsin, and constitute at least one-half of the barley crop. The Manshury barley (Wisconsin No. 62) was developed from the old Manshury formerly introduced by the College, but which had become mixed to such an extent that many of its most valuable characteristics had become almost extinct.

The Oderbrucker barley (Wisconsin No. 55) is an improved variety developed from seed secured from the Guelph, Ontario College in 1899. For stiffness of straw, plumpness and quality of kernel, and yield, little difference can be noted between the select Oderbrucker and the Manshury barleys. Barley centres have been established and encouraged in the barley growing districts, so it is now possible to find whole communities attempting to grow one or the other of the varieties named. It is our earnest desire that freak barleys be discarded and the energy of our farmers concentrated on the growing of not more than three good varieties. Our farmers cannot afford to grow scrub barley any more than they can afford to breed scrub cattle, sheep or swine.

Pedigreed barleys.—In 1902 the Hays method of cereal breeding was adopted as being more exact and preferable to the selection method used prior to that date. Under the Hays system two thousand kernels or over are taken from some select stock and planted with special machinery so that the kernels will be an equal distance apart. After careful study the

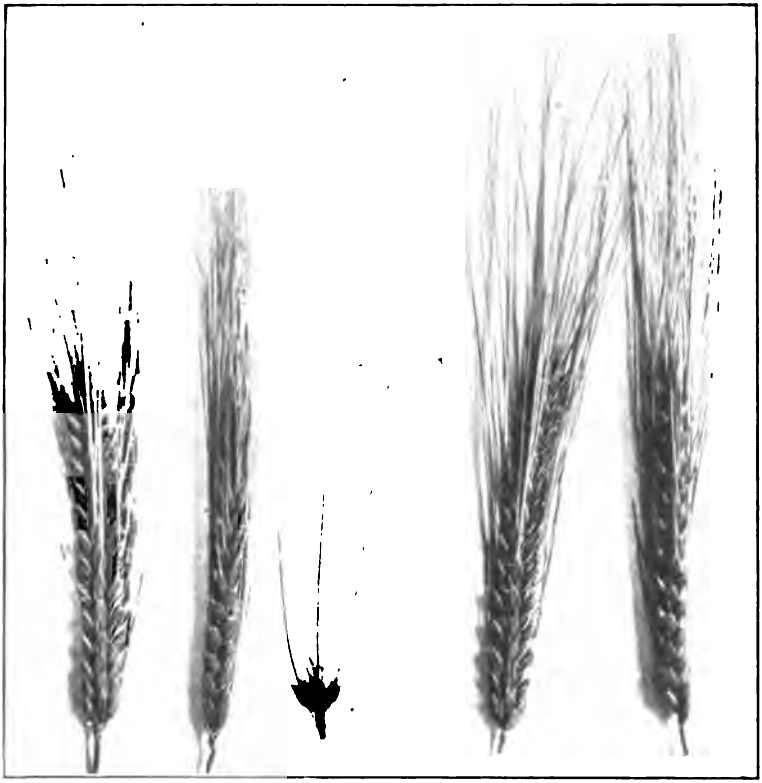


Fig. 73.—Characteristic heads of the select Oderbrucker and Manshury barleys. Oderbrucker on left; Manshury on right. The attachment of kernels to the rachis is shown in the center.

grain from the best twenty plants is selected and put into envelopes, weighed and the ten heaviest retained as seed for the following year's crop. The second step is to take one hundred of the seed retained from each envelope and plant in separate beds, known as centgener plots, each plot being planted from the progeny of a single seed of the previous year. The best heads are selected from the best plants of each centgener plot and are retained for the next year's centgeners. The work is repeated the next year, and the following year the best six centgener plots are selected and the seed saved for trial plots. One year in the trial plots may reduce the number of varieties to four or even less, to be continued in the increase plots until such time as sufficient seed is secured for dissemination.

By the above systems of breeding the Wisconsin pedigreed barleys have been developed and will be known henceforth as Wisconsin pedigree barley Nos. 1, 2, 3, 4, etc.

Sixteen different strains of pedigreed barleys have been grown in the increase plots this season and approximately sufficient seed of each has been secured to plant two acres in 1908. This pedigreed seed cannot be disseminated until 1910. At the date named, eleven years of continuous work will have been placed upon these pedigreed barleys and their characteristics will be so firmly fixed that they will remain stable and at least one or two of the varieties will become leaders in production and warrant the energy of our barley growers being centered upon them.

WINTER WHEAT.

From tests made at the Station farm and at farms of members of the Experiment Association we find that in many localities winter wheat proves to be a paying crop. As will be noted in the table on page 389 the several varieties on trial gave an average yield of twenty-six bushels per acre. The increased price of wheat and flour warrants farmers who live in favored localities, to grow a few acres of wheat, or at least sufficient to make flour for family consumption. Winter wheat can be sown at a time of year when the farmer is not rushed to the extreme, and every acre sown in the fall will relieve the stress of work the following spring.

FALL RYE.

For seven years variety tests have been conducted with fall rye and an attempt made to breed a pedigreed variety that would surpass other varieties in point of yield and flour production. Two new varieties have been bred from the Schlansted and Petkus foundation that promise fair for the future. These varieties will go into the increase plots in 1908.

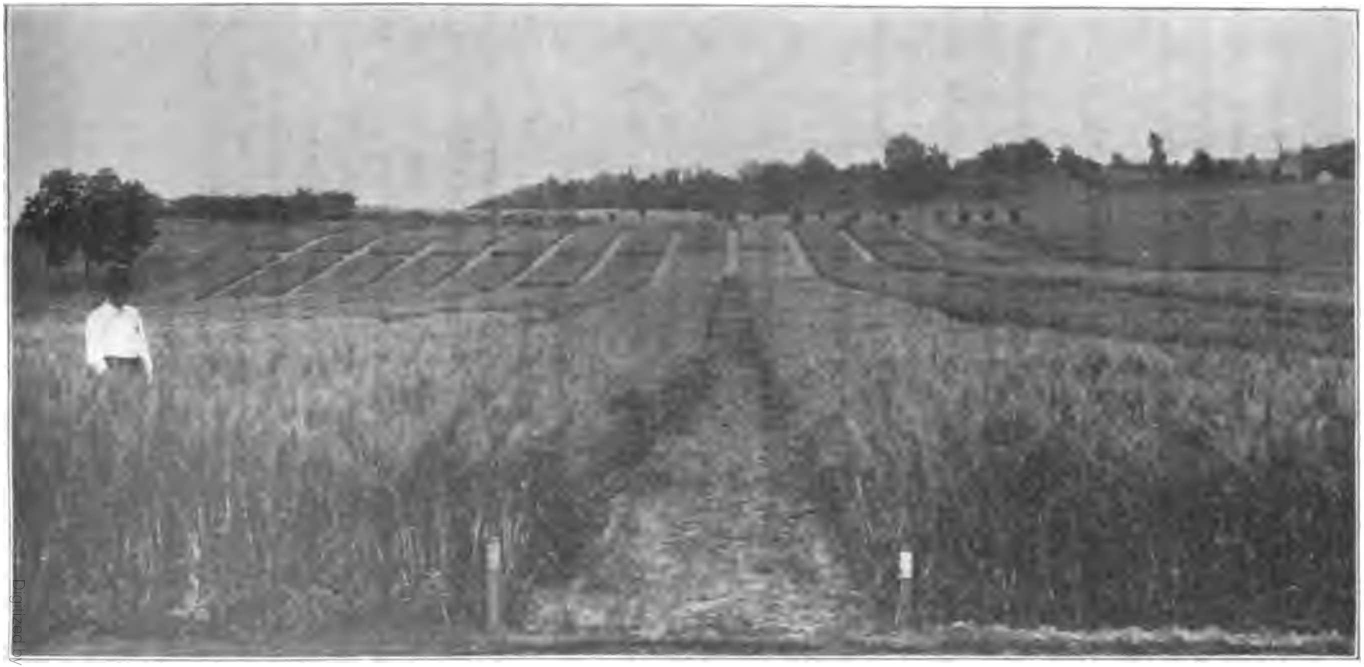


Fig. 74.—Pedigreed varieties of Oderbrucker barley. Agronomy field, Madison. The type and progeny secured through eight years' consecutive work in the breeding plots.

BUCKWHEAT.

The Silver Hull variety of buckwheat was tested on the Agronomy field. The grain was sown on a sandy hill that hitherto had produced poor crops. The soil was characteristic of much of the light soils of Wisconsin on which buckwheat could be grown successfully.

Plants will be selected from this season's crop to lay the foundation for future pedigreed seed.

There seems to be a special place in Wisconsin agriculture for buckwheat as we are only growing a small fraction of what we consume. The milling companies of Wisconsin have in past years imported from other states three-fourths of the buckwheat used. The pure food laws and the increased consumption of buckwheat flour will maintain good prices for this crop.

TESTS WITH SELECT VARIETIES OF CORN.

The varieties of corn under experiment were Silver King (Wisconsin No. 7), The Golden Glow (Wisconsin No. 12), the Smut Nose flint (Wisconsin No. 13), and the Early Yellow Dent (Wisconsin No. 8).

One measured acre was planted to the Silver King corn in accordance with the ear-to-the-row method. For four years this method has been followed with a view of growing corn each year of higher vitality and yielding capacity than the crop of the previous year. A thirty-eight row test was run this year on the acre of ground set aside for the experiment, each row being planted with seed taken from a single ear. The ear having the least number of kernels was used for the index row and the other rows were of the same length, having the same number of hills and the same number of kernels per hill. Butts and tips were rejected on each ear and surplus kernels of the larger ears were retained for general use.

As in previous years, a distinct difference could be noticed between the vitality and vigor of the rows from the time the corn appeared above ground. Each seed ear seemed to have an individuality or projected efficiency that was plainly notice-

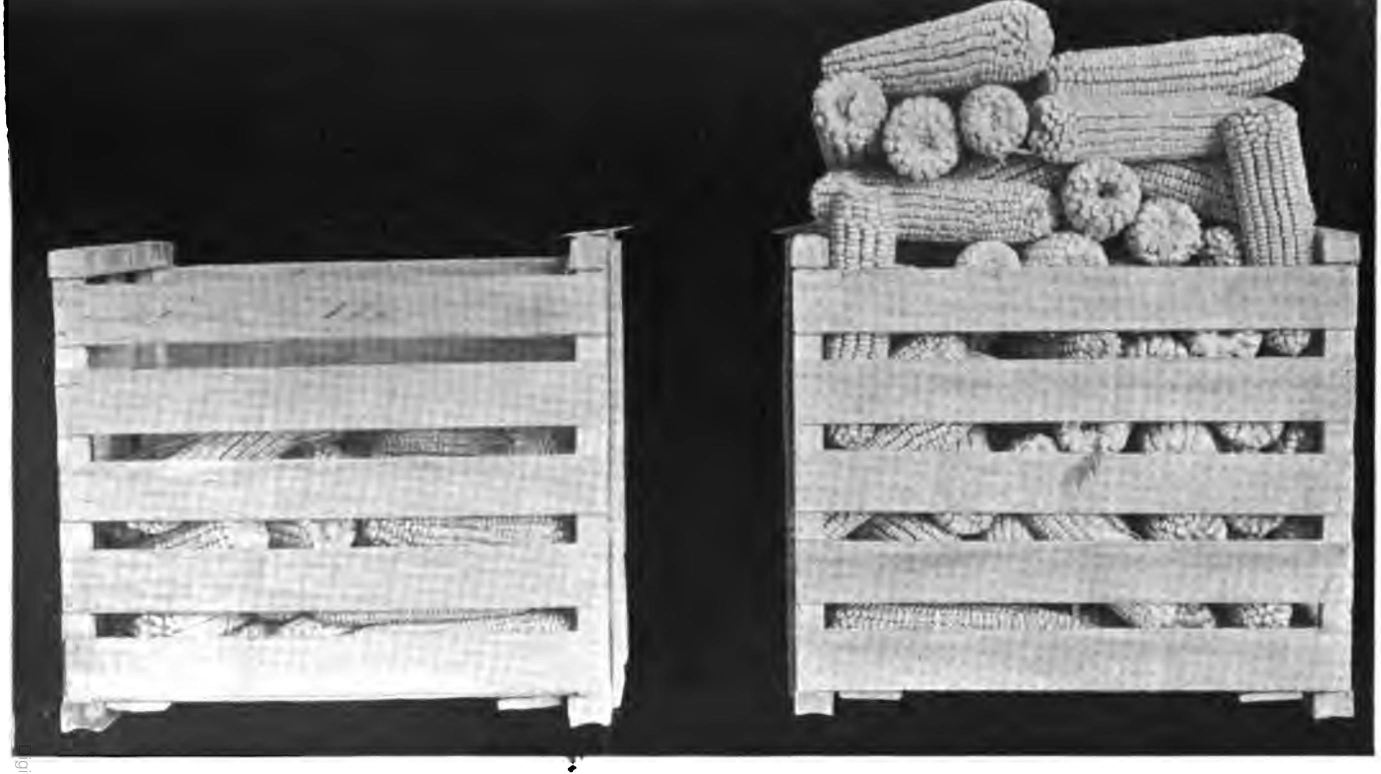


Fig. 75.—Ear-to-the-row method of corn breeding. Variation in yields of good seed corn from rows planted with seed from two different ears. Crate on left, row 18, 29 pounds seed corn; crate on right, row 11, 62 pounds seed corn. Good seed corn worth three dollars per bushel in the ear.

able from the early part of the growing season. Altern
were detasseled to prevent close breeding and the Ex
Station corn field of next year will be planted from
tasseled rows bearing the greatest amount of good seed

Each row was harvested separately, October 8, and
separated into seed ears, marketable feeding ears, and

TABLE II.—*Yields of different grades of Silver King* (
No. 7) corn from individual rows planted from the
single ears.

No. of ear.	Seed corn.	Marketable feeding corn.	Nubbins.
	Lbs.	Lbs.	Lbs.
1	19	109	20
2	33	113	12
3	30	128	21
4	53	204	11
5	29	141	8
6	36	150	25
7	37	201	6
8	43	21	19
9	40	90	6
10	56	190	8
11	61	197	8
12	48	170	22
13	37	198	2
14	34	163	15
15	39	108	7
16	44	195	18
17	55	198	11
18	29	180	8
19	46	215	6
20	33	174	25
21	35	203	22
22	26	203	21
23	30	156	14
24	29	175	22
25	32	221	7
26	38	224	14
27	28	190	7
28	26	166	14
29	54	189	11
30	46	163	37
31	36	128	13
32	50	165	54
33	27	115	19
34	26	129	35
35	47	139	20
36	39	201	32
37	48	125	34
Total	1,419	6,037	629

Seed corn 17.55 per cent.
Marketable corn 76.66 per cent.
Nubbins 7.77 per cent.

From Table II we find there is a variation in yields
seed ears from individual rows. Row 11 gives a yield
one pounds of seed ears, while Row 1 yielded but ninetee
seed ears. The importance of this difference is ap

when we realize that good seed ears are worth from three to four dollars per bushel while feeding corn is worth fifty to sixty cents. The seed corn is also doubly valuable from the high yielding rows as the desirable characteristics of breeding true to type have become so fixed that the value of the corn for seed is far above that from the average row.

In total yield there is also a wide variation. Row 25 gives a yield of 269 pounds of corn and Row 8 but 83 pounds. The difference in yield of seed corn and total yield is not so great this year as in previous year's tests, as through the selection method of breeding practiced the corn has become more uniform and stable in character.

A vitality test was made to determine how well corn would retain its viability when exposed to the elements. A row from the 1906 crop was left standing through the winter months and tests for viability were made from time to time. The fall was exceptionally fine and the corn was thoroughly matured before freezing weather. The tests showed a uniform germination from all ears of one hundred per cent prior to the zero weather. After the thermometer registered below zero the viability of the corn immediately dropped in all ears with the exception of one which gave a test of one hundred per cent throughout the winter. The vitality of this ear was impaired as was shown later when the ear was carried into the planting test. The progeny did not show the vigor of the kiln dried corn nor did it produce any great number of good seed ears.

TABLE III.—*Vitality test.*

No. of ear.	Number of kernels taken from ear for each test.	NUMBER OF KERNELS GERMINATING ON EACH DATE.							
		Dec. 15	Jan. 15	Jan. 21.	Jan. 30.	Feb. 14.	Feb. 28.	Mar. 15.	Apr. 1.
1	6	6	6	6	5	0	1	0	1
2	6	6	6	4	0	0	5	0	0
3	6	6	6	5	3	0	0	1	0
4	6	6	6	6	6	4	4	4	1
5	6	6	6	6	6	6	6	6	6
6	6	6	6	6	6	5	2	4	5
7	6	6	6	5	5	6	0	0	0
8	6	6	6	6	5	6	0	5	5
9	6	6	6	3	3	1	1	3	2
10	6	6	6	0	0	0	0	0	0

The apparent inconsistency in germination as shov
Nos. 2 and 8 is explainable on the grounds that ker
taken from more protected portions of the ear on Fel
in the case of Ear No. 2, and March 15 of Ear N
had been done on the preceding dates.

Ear No. 5 withstood the rigors of winter and st
germination of one hundred per cent on April 1,
danger of freezing was over.

The general corn field of 18 acres was planted w
seed, the progeny of high yielding rows from the se
1906. The season was extremely backward, and af
ing the seed lay dormant for three weeks; as soo
weather conditions became favorable the corn spro
came above ground showing an average stand of th
to the hill. The corn showed remarkable growth d
latter part of the growing season and was well matur
tober 1. The crop was harvested the first week of
and gave an average yield of 63.8 bushels of shelled
acre.

The sorting tests gave an average yield of 17 per
ears all of which will be fire dried and used for the
ment of corn centres for 1908.

Cost of production.—The following data gives th
labor performed and approximately the cost of proc
corn per bushel.

Hand labor and team work:—

1903.
October. Plowing, thirteen days at $4..........
April and May. Disking, seven days at $4........
May. Planting, three days at $4................
May and June. Harrowing, five days at $4.......
June and July. Cultivation, eighteen days at $4...
October. Harvesting, four days at $4...........
October. Shocking, 15 days at $2...............

Total expense for labor....................

Other items of expense:—

Three bushels of seed corn at $3	$9 00
Binding twine (estimated)	10 00
Husking and cribbing $5 per acre	90 00
Total cost of growing, harvesting, and cribbing eighteen acres of corn	$339 00
Cost of growing, harvesting, and cribbing per acre	18 83
Approximate cost per bushel (63.8 bushels per acre)	29.5cts.

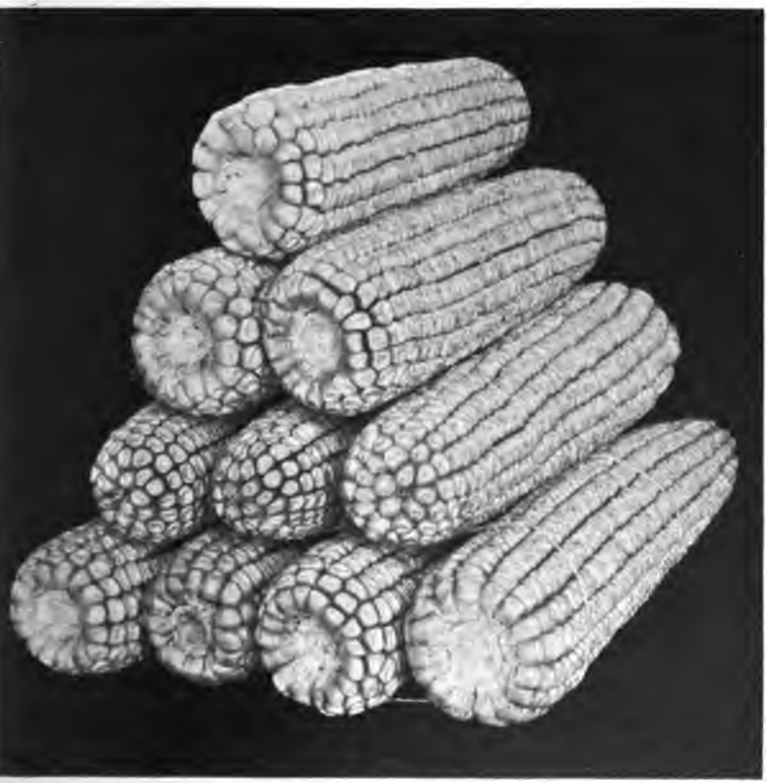


Fig. 76.—Characteristic sample of Silver King corn, Wisconsin No. 7. Yield on breeding plot Station farm in 1907, ninety-eight bushels of shelled corn per acre.

The Silver King corn is being widely disseminated through the agency of the Wisconsin Experiment Association, 454 members carried on tests the past year in 49 counties of the State.

From data received we find that the corn is satisfactory in approximately every county where grown in the southern half of the State.

Stalk test with Early Yellow Dent (Wisconsin No. 8).—A test was made with the Wisconsin No. 8 corn to determine the yield of grain in comparison with the number of stalks to the hill. A one acre plot was planted to this corn, dropping one, two, three, four and five kernels to the hill. The corn was planted on low ground and the excessive rains flooded the plot to the extent that the experiment was ruined and the plot of corn was merely harvested for seed and feeding corn. Experiments will be continued along this line to determine as far as possible the most desirable quantity of seed per hill or acre for grain and forage.

One hundred and eighteen members of the Experiment Association carried on tests with Early Yellow Dent (Wisconsin No. 8) the past season in 47 counties of Wisconsin.

Golden Glow corn (Wisconsin No. 12).—Fourteen acres of the Golden Glow corn were planted for seed and silage purposes. This variety was bred by the Station in 1904 by crossing the Wisconsin No. 8 onto the Toole's North Star. The desire was to secure the early maturing qualities of the No. 8 and the high yield of the North Star. Of seventeen crosses on various varieties of yellow corn used as mother plants, the cross of the No. 8 on the North Star was the only successful one in which the good qualities of both parent varieties were successfully blended.

The Golden Glow corn has been grown for three successive years and the characteristics have become so fixed that we deem it advisable to disseminate this variety in different localities of the State.

Smut Nose Flint corn (Wisconsin No. 13).—An acre plot of Smut Nose flint was grown on the Station farm for the purpose of getting foundation stock for further experiments. This corn was planted on land that was saturated with moisture, which prevented the growth and development of the corn and the crop was harvested as fodder corn.

TESTS WITH GRAINS AND FORAGE PLANTS AT THE NORTHERN SUB-STATION FARMS.

R. A. MOORE AND E. J. DELWICHE.

The work with grains and forage plants at the Sub-Station farms for 1907 is largely a continuation of the work started in 1906. Many new varieties of grains have been tested this season and compared with varieties tried the previous year. The dissemination of pure bred varieties of grain as soon as they become acclimated is being especially emphasized.

TESTS WITH GRAINS.

Barley.—To test the advisability of barley culture on the mixed clay and sandy loam of northern Wisconsin three-fourths of an acre of the Oderbrucker variety was sown on land belonging to Mr. R. A. Steckbauer, one-half mile north of the Iron River farm. In early spring the land was given a top dressing of barnyard manure. The barley was sown May 11, using two and one-half bushels of seed per acre. The crop came up well and stood three and one-half feet high when fully headed. The yield was thirty-six bushels per acre, several bushels above the average in this locality for this season. It is believed that barley will do well on this type of soil when proper attention is given to rotation of crops and the manuring of the land. Similar tests were made at Ashland and Superior on heavy clay soils. At both Ashland and Superior the barley yielded twenty bushels per acre. In general the re-

sults with Oderbrucker barley are satisfactory co
unfavorable season.

Brewing barley.—A test of brewing barleys wa
operation with the Bureau of Plant Industry,
Department of Agriculture. The varieties tri
rowed barleys with the exception of Sexradigt, w
rowed variety.

The results at Ashland and Iron River are giv
lowing table:—

TABLE I.—*Brewing barley trials, Northern Sub-st*

On heavy clay at Ashland farm.

Variety test.	United States No.	Area of plot.	Date sown.	Stand.	Average number of stems per plant.
		A.		Per ct.	
Improved Chevalier..	20845	One-fortieth ..	May 4	.85	4
Sexradigt	19784	One-fortieth	May 4	.68	3
Primus	19779	One-twentieth	May 4	.85	5
Chevalier II	19781	One-twentieth	May 4	.85	4
Svanhals	19782	Ohe-twentieth	May 4	.83	4
Gutekorn	19783	One-twentieth	May 4	.80	3
Prinsess	19780	One-twentieth	May 4	.70	4
Hanchenn	10585	One-twentieth	May 4	.78	4
On sandy soil at Iron River.					
Hanchenn	10585	One-fortieth ..	May 2	.80	3
Primus	19779	One-fortieth ..	May 2	.75	3
Prinsess	.....	One-fortieth ..	May 2	.77	3
Chevalier II	19781	One-fortieth ..	May 2	.76	2
Svanhals	19782	One-fortieth ..	May 2	.75	1.5
Gutekorn	19782	One-fortieth ..	May 2	.75	1.8
Sexradigt	19734	One-fortieth ..	May 2	.75	1.5
Improved Chevalier	20845	One-fortieth ..	May 2	.75	2

The season was unfavorable; the rainfall in J
nine-tenths of an inch at Ashland, and two and
Iron River. This and the fact that the barleys
climated accounts for the low yields reported.

Oats.—Swedish Select oats were again used a
at the Northern Sub-Stations. The yield per a
factory for the season, being 20 bushels per acr
12½ bushels at Iron River, and an average

Ashland for the Soils and Agronomy plots. The weight per
shel averaged 38 pounds for Ashland and Superior and 33
unds for Iron River. Very little rust was present on Swed
Select oats during the past season.

Rust resistance test.—At Superior five varieties of oats were
wn in twentieth acre plots with a view of testing their rust
isting qualities. The results are shown in the following
le:—

TABLE II.—*Test of oats for rust resistance.*

Variety.	DATE.			Order of rust resist ance.	Estimated yield per acre.
	Sown.	Appearing above ground.	Ripe.		
erican Banner............	May 1	May 29	Aug. 30	2	19
olsk........................	May 1	May 29	Aug. 28	1	18
dish Select................	May 1	May 29	Aug. 29	3	20
y Day.......................	May 1	May 29	Aug. 18	1	15
rian	May 1	May 29	Aug. 31	4	20

As is indicated in the table, Sixty Day and Tobolsk stood
t in rust resistance, but gave the lowest yields. It is pro-
sed to conduct this test on a more extensive basis in the
ure.

Winter wheat.—In cöoperation with the Bureau of Plant
dustry, United States Department of Agriculture, a com-
rative test of several varieties of winter wheat was carried
at Ashland on red clay and at Iron River on red sandy
l. The results are given in the following table:—

BLE III.—*Comparative tests with winter wheat, Ashland station*

Variety.	Winter emmer.	Bacsca.	Padii.	Galgalos.	Khar-koff.	Belo-glina.
ted States No.	17,098	11,614	9,129	17,097	12,008	7,787
e sown	Sept.18	Sept.18	Sept.19	Sept.19	Sept.19	Sept.10
e ripe	Aug. 20	Aug. 12	Aug. 20	Aug. 12	Aug. 12	Aug. 5
cent killed by frost	30	43	25	80	25	20
nd in per cent.	25	60	65	10	60	75
t	None....	None....	Trace...	Much present	None ...	None.
nt	None...	None ...	None ...	None...	None ...	None.
ging	None....	None....	None,...	None ...	None.,..	None.
ght in inches..........	36–48	36–48	42–45	30	36	33
ld per acre. in bushels...	5.5	5.2	10.35	3.50	10.5	12.0
ght per measured bushel, pounds..................	38	63	60.5	59	68.0	67

ields were determined from one-half acre plots, handled as one field before sowing.

By referring to the table it is evident that t
lowered by winter killing of the grain. The c
first part of the winter well but were thinned
usually severe spring frosts. It is too early t
itely on the varieties best adapted to this regio
Beloglina, Kharkoff and Padii made the best s

Four varieties of winter wheat were on test
namely, Ghirka, Beloglina, Padii, and Ulta.

The results are given in the following table:—

TABLE IV.—*Comparative tests with winter wheat*
Station.

Variety.	Ghirka, United States No. 11607.	Beloglina. United States No. 11604.	Padii, United St No. 912
Date sown	Sept. 24, '06.	Sept. 24, '06.	Sept. 24,
Date ripe	Aug. 7, '07.	Aug. 7, '07.	Aug. 12,
Per cent killed by frost	15	10	12
Stand in per cent	65	70	65
Rust	Some on leaves	A little	Considera
Smut	None	None	None
Lodging	None	None	None
Height in inches	34	34	36
Yield* per acre in bushels.	12.5	12.0	10.0
Weight per measured bushel in pounds	60	58	58

*No conclusion can well be drawn as to the relative value of
as there was only a small difference in the yields.

Corn.—Two varieties of dent corn were on tri
River farm during the past season, Silver Kin
No. 7), and Early Yellow Dent (Wisconsin No.
was planted May 27 in check rows 3½ feet ap
Unfavorable weather conditions early in spring a
gust and September prevented the corn from r
Several bushels of seed corn were obtained a
One-half acre was planted to Wisconsin No. 7.
yield of 12¾ tons of silage corn and 84 bushel
per acre. One acre of Wisconsin No. 8 dent cor
at the same time as Silver King. The crop was
as the Silver King, giving a yield of ten tons of
55 bushels of ear corn per acre. This corn mat
well ripened when frost came on Sept. 25.
selected for early ripening qualities. Several va

corn were tried at Superior and at Ashland none of which
reached full maturity. A variety of Smut Nose flint intro-
duced this spring matured a few ears.

TESTS WITH FORAGE PLANTS.

Alfalfa.—In the spring of 1906 one and one-half acres were
eeded to alfalfa on the Iron River farm, barley being used as
nurse crop. The ground was inoculated with soil from the
tation farm at Madison, but only a few nodules developed.
n the fall of 1906 one acre was re-sown and re-inoculated.
he alfalfa came up well and made a good growth before snow
ll. On March 25, 1907, when the snow left the ground, the
falfa was green and promising. Unusually severe spring
osts so thinned the stand, however, that it was decided to re-
ed. This was done May 21. The ground was plowed to a
pth of five inches and given a light dressing of barnyard
anure. Soil was taken from the adjoining field where nod-
es were present in 1906, and spread over the whole field.
e alfalfa came up well, and notwithstanding the dry weather
spring and early summer, made a good growth. The field
s clipped three times with the mower during the season and
September 20 the alfalfa was a foot high and apparently
ll established and almost a perfect stand. Nodules were
undant on the roots of the alfalfa plants and prospects for a
rmanent catch of alfalfa seem good.

Soy beans.—One-fourth acre was planted to Wisconsin
rly Black soy beans on the Iron River farm. The beans
re planted on light sandy soil which was in sugar beets last
ar. No fertilizer was applied but soil from an adjoining
t, previously seeded to soy beans, was spread over the sur-
e to inoculate it. Nodules developed in abundance. The
ns were planted in drills 33 inches apart and thinned to 4
hes apart in the rows. The crop was ripe September 20,
d gave a yield of 12 bushels per acre.

Sugar beets.—One acre was planted to sugar beets at the
n River Sub-Station. Of this one-half acre was planted in
peration with the Department of Chemistry. This test is

reported on page 341. The other one-half acre was plowed in the fall of 1906 the south half having been corn land and was manured at the rate of sixteen tons per acre; the north half which was in soy beans in 1906 was also fall plowed but unmanured. The beets were planted on May 1, and were well up by June 1. On June 9 an unusually strong southwest wind covered the plants with sand which greatly checked their growth; this was especially true on the north half of the plot. Sodium nitrate at the rate of 200 pounds per acre was applied to one-half of the field.

The yield and tests are given in Table V.

TABLE V.—*Effect of fertilizer and yieldon quality of beets.*

Treatment.	Yield per acre, tons.	Per cent sugar in beets.	Per cent purity.
Sodium nitrate, 200 pounds	7.912	19.41	90.2
Check	5.374	19.17	92.2
Increase or decrease	+2.538	+.24	—2.2

Owing to the unusual conditions described above, the yield was at least thirty per cent below normal. The value of sodium nitrate as a fertilizer is plainly evident from these results. In the fertilizer experiments conducted on the other half acre an increase in the yield of beets of nearly four tons was obtained as a result of a similar fertilization with sodium nitrate. At $6.50 per ton for the beets, the use of $5.50 worth of fertilizers increased the value of the crop approximately twenty dollars per acre, with a slight increase of expense for hauling. In normal seasons probably not so great an increase in yield would be noted.

Clover.—Thirty-seven strains of medium red clover were sown this spring on the Iron River farm with a view of testing their value as seed producers. The work is done in coöperation with the Bureau of Plant Industry, United States Department of Agriculture. Among the varieties now on trial, three belong to the hairless type, viz, Orel, Ufa, and Courland. Seeds of these varieties were also supplied to farmers to be grown on a larger scale and under different soil conditions. The clovers on the whole were a fair catch, although the dry cold weather in spring affected the stand.

Fig. 77.—Alsike clover grown for seed at Sub-Station farm, Superior. Yield of clean seed, five bushels per acre.

Hulling experiments.—In order to demonstrate the feasibility of growing clover for seed, demonstration experiments were carried on at Superior and Ashland. At Superior alsike clover yielded five bushels per acre. At Ashland the yields were as follows for different times of cutting:—

TABLE VI.—*Comparative methods of growing clover for seed.*

Time of first cutting.	Disposal of first cut.	Yield per acre in bushels.
June 25	Left on ground	2
July 1	Made into hay, ¾ tons per acre.	1⅓
July 10	Made into hay, 1 ton per acre.	.9

A coöperative experiment with alsike clover for seed carried on by Roffers Bros., Ashland, gave an exceptionally fine yield. On a one acre tract eight bushels of clean seed were produced. Owing to the fact that clover seed is worth from eight to nine dollars per bushel, the crop was considered exceptionally fine. A large number of coöperative experiments with different farmers are in progress and will be watched with interest.

Coöperative grain work with farmers.—About one hundred farmers in the northern counties coöperated with the Station in the testing of standard grains. The trials made were with Oderbrucker barley, Swedish Select oats, and Wisconsin No. 8 corn. This work will be reported later in bulletin form.

BARLEY SMUT INVESTIGATIONS.

R. A. MOORE AND A. L. STONE.

The modified hot water treatment was again used for the prevention of barley smut and in every instance with slight variation corroborated the work of 1906.*

The sacks of seed barley were soaked for twelve hours in cold water then left to drain for an hour. After draining, the sacks of barley were submerged for two minutes in water not above 130°F., to take off the chill and were then submerged in a tank containing water held at a constant temperature of 130°F.

The cold weather following the seeding seemed to affect in a detrimental way the treated seed. Some of the kernels of soaked barley failed to germinate and the stand was somewhat thinner on the plots where the barley was treated than on plots where the seed was not treated.

The soaking of the seed barley softens and enlarges the berry so that due allowance must be made when sowing with drill or seeder.

One hundred members of the Experiment Association carried on coöperative tests for the prevention of smut in various parts of the State. The Select Oderbrucker barley which was affected with only a limited amount of smut was used for approximately all the tests; otherwise the variation in amount of smut found would have been much greater.

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*23 Ann. Rept. Expt. Sta. p. 270.

From the data received we are able to report as follows:—

Number experimenting	130
Number reporting to date	100
Number of counties from which reports were received	39
Number treating barley	99
Average per cent of smut in untreated seed	2.93
Average per cent of smut in treated seed	.65
Average per cent of crop saved by treatment	2.28
Number reporting poor germination of treated seed after sowing	30

From the tests made at the Station Farm and from data received from members of the Experiment Association we find that the loose smut of barley can be eradicatd by the modified hot water treatment.

The barley is affected throughout the State to the extent of approximately 7 per cent, entailing a loss to the farmers of Wisconsin of one-half million dollars annually.

Until the Station has tested further with large quantities of seed it is preferable for farmers to treat merely sufficient to sow one or two acres, the crop from which can be threshed separately and saved for the following season's sowing.

The safe temperature of the hot water in which the barley is submerged to make the treatment effective and not kill the seed grain seems to have but a limited range.

Barley should be sown immediately after treatment, otherwise it will sprout and render sowing difficult.

Barley should not be treated or sown before the ground has become warm so that germination will not be retarded after seeding.

ERADICATION OF FARM WEEDS.

R. A. MOORE, A. L. STONE, AND GEO. HUTTON.

Experiments started in 1906 on weed eradication were continued in 1907. The tests made were largely checks on last year's work and experimentation on other farm weeds. Various makes of sprayers were tested to determine those most convenient and effective for spraying work. A bulletin is now in preparation covering the two years' tests. Experiments will be continued another year.

Our attention was called during the winter of 1907 to a poster that was being sent broadcast throughout our State by W. J. Mallett, Mexico, Missouri. It claimed that an effectual remedy was found for the eradication of quack grass by the use of an anti-quack grass mixture. This mixture was to be sown on the fields affected with quack grass. The material sufficient to sow an acre, with instructions, could be procured for three dollars. A forfeiture of one thousand dollars was guaranteed by the seller if the mixture was not effective. The mixture was purchased by the Experiment Association and tried on the Station farm in accordance with directions. An examination showed it to be rape seed and material resembling charcoal and iron sulphate. The rape plants came on readily after sowing the mixture but were soon outstripped by the quack grass. In October when all quack grass should have been killed according to the directions given in the circular very little rape could be seen as the quack grass had it completely under control. The quack grass did not seem to have suffered from the treatment and no further tests will be made with the anti-quack mixture as it proved to be of no value whatever.

ERADICATION OF QUACK GRASS BY CULTIVATION.

Test 1.—One-half acre of quack grass was eradicated on the Agronomy field in the season of 1906 by cultivation. The ground was plowed six inches in depth after the removal of a cereal crop in the fall and with spring tooth harrow the roots were brought to the surface and raked from the ground with hay rake and left in piles to be burned. As soon as the land became sufficiently dry in the spring to work well the ground was plowed a little deeper than the plowing done the previous fall and dragged with spring tooth harrow at intervals of several days to bring roots to the surface and prevent the growth or rooting of any of the grass.

During a dry period in July the ground was disced and harrowed. The last plowing and harrowing were performed in September when no more quack grass roots were to be found. The spring following the land was sown to barley and not a single plant of quack grass made its appearance. The estimated cost of eradicating the quack grass from the one-half acre was eighteen dollars. No crop was grown on the land during the season. The cultivation method of eradication is expensive but it is the most reliable remedy known at the present time. If there is any doubt as to whether the quack grass is entirely eradicated it is best to plant a crop that requires intensive cultivation the year following the eradication test.

BREWING BARLEYS.

C. P. NORGORD.

The subject of barley presents three phases of study, viz, the problems relating to markets, to the brewing industry, and to the plant breeder and producer. The farmer is directly concerned with all of these problems. Briefly stated, the barleys of the world are mixtures of many varieties, as two-rowed, four-rowed, and six-rowed, early, late, those of high protein content, and those of low protein content. The majority of these lack in quality. Not a single pure variety can be found in the markets of the United States. The different varieties require different lengths of time to complete germination upon the malting floor. At whatever time the germination is discontinued, there will be a loss of extract and a loss of quality due to molds and bacterial action. These difficulties will be remedied by the production of improved pedigree varieties. The Wisconsin Experiment Station has bred sixteen varieties of pedigree barleys which will be ready for dissemination within two years. During the past year co-operative work with the Department of Agriculture has been taken up along the following lines: (a) laboratory study of barleys from a botanical and chemical standpoint; (2) testing the results of laboratory investigations by practical application; (3) the importation of pure races of barley; (4) the breeding of pure races from promising market brewing barleys; (5) testing barleys for yield and malting qualities; (6) the establishment of large centers for each variety of barley; (7) dissemination of information on culture and care of barley.

The laboratory work was carried on by the United States Department of Agriculture. Much valuable work has been accomplished in this line during the year, a report of which will be published later.

Eight varieties of pedigreed barleys, which have gained some reputation in Europe as brewing barleys, were introduced from the Seed Breeding Institute of Svalöf, Sweden. These barleys were bred by Dr. Hjalmar Neilsson, one of the world's most noted plant breeders. They were grown at the Wisconsin Station and Sub-Stations and at thirty-three other places widely distributed throughout the United States. Outside of Wisconsin many of the tests have been vitiated by irregularities of weather, as drought and an over supply of rain. From reports at hand, the barleys giving the best satisfaction were Svanhals, Chevalier, Prinsess, and Primus. A test of forty other varieties was also conducted at this Station. For this test the barley was planted in rows sixteen feet long and eight inches apart.

The results obtained are given herewith:—

TABLE I.—*Pedigreed barleys introduced from Svalöf, Sweden.*

VARIETY.	S. P. I. number.	Type.	Number of days maturing.	Length of head in inches.	Heads per plant.	Per cent possessing stiffness of straw.	Per cent resistant to rust.	Per cent resistant to smut.	Weight per measured bushel.	Yield grain.	Straw per acre.
									Lbs.	Bu.	Tons.
Svanhals	19782	two row	96	2½-3½	3-5	85	93	98	42	17.1	1.35
Primus	19779	two row	96	3 - 4½	2-6	90	90	99	42	6.6	1.37
Prinsess	19780	two row	100	1½-4	2-5	85	95	100	42	6.1	1.36
Chevalier II	19781	two row	100	3 - 5½	3-6	75	95	100	42	9.6	9.2
Sexradigt	19784	six row	90	1½-2¾	2-5	75	95	100	45	14.1	......
Gutekorn	19783	two row	95	2½-3	2-7	80	90	100	44½	12.5	1.2
Handekorn	20482	two row	88	2½-5	4-6	80	95	100	48	14.7	.61
Gotland	20483	two row	94	2½-2¾	2-7	80	95	100	45	28.7	.76
Yatte Sexradigt	20481	six row	89	2 - 3¼	2-6	86	95	95	43	13.3	1.48
*Manchuria, Guelph Pedigreed	20824	six row	90	2 - 3¼	2-7	90	95	100	44	26.5	1.11

*This barley received from Prof. C. A. Zavitz of Guelph, Ontario College of Agriculture.

TABLE II.—*Variety tests of common barleys, 1907.*

VARIETY.	S. P. I. number.	Type.	Number days maturing.	Heads per plant.	Per cent possessing stiffness of straw.	Per cent resistant to rust.	Per cent resistant to smut.	Length of head in inches.	Weight per measured bushel.	YIELD POWERS.	
										Grain.	Straw.
									Lbs.	Bu.	Tons.
Hanna	12993	two row	96	3-10	80	90	95	3½-5¼	43½	8.9	.585
Canadian Lake Shore	2081	six row	89	2-5	85	90	98	2 -3¼	42	29.2	1.27
Scotch	20816	six row	89	2-6	85	90	98	2 -3	44	26.3	1.22
Bay Brewing	20815	six row	88	2-5	75	80	95	1½-2½	39½	26.5	.985
Smyrna	12023	two row	87	2-3	50	85	90	2 -3	39	20.8	.90
Albacete	7427	six row	95	2-10	80	85	90	2 -3	......	.....	......
Beldi	11716	six row	89	2-6	50	50	90	2½-4	34	20.5	1.20
Standwell	20819	two row	89	2-6	90	80	90	2½-3¼	42	19.5	1.30
Mansfield	20818	six row	89	2-5	85	80	95	2 -3½	38	20.	1.32
Invincible	20820	two row	99	2-9	95	80	95	2½-3¼	42	8.3	1.40
Sydney	20821	two row	89	2-5	75	85	80	2½-3	40½	20.	1 12
King's Prize Chevalier	20845	two row	101	3-6	75	95	100	3½-4	42	7.9	1.09
Webb's Burton Malting	19549	two row	89	2-9	85	90	95	2 -3½	......	......	......
Webb's Kinver Chevalier	19548	two row	86	2-6	80	85	85	2 -4	......	......	......
Manchuria	208	six row	89	2-5	88	85	98	2 -3½	40	20.4	1.9
Golden Queen	......	six row	94	2-4	88	80	95	2 -4	40	32.0	2.1
Royal	20825	six row	94	2-5	75	85	90	2 -2½	40	14.1	2.56
Garton's Six Rowed	10363	six row	89	2-4	80	75	98	2 -3	35	3.7	2.1
Odessa	20830	six row	89	2-3	80	75	90	2 -3	40	10.8	2.49
Silver King	20836	six row	89	2-4	88	85	90	2 -3½	44	29.5	2.16
Mensury	20823	six row	89	2-4	85	90	95	2 -3½	43	27.5	2.14
Franken	20822	two row	94	2-8	78	85	95	2 -4	40	10.8	1.79
Oderbrucker	20835	six row	89	2-5	85	90	90	2 -3½	40	32.7	1.57

Line breeding was also started with fifteen promising varieties of brewing barleys. A few of these must be discarded but a sufficient number remain to make a good start toward producing a number of pure bred strains.

EXCHANGES.

This Station takes pride in the fact that it has on file an almost complete list of the leading agricultural papers in the United States, besides many from foreign countries, and some not strictly treating of agriculture. These papers come to the Station in exchange for its reports and bulletins. While of the highest value to those connected with the Station as the expression of agricultural experience and sentiment, they are placed where they can be read and referred to by our agricultural students, and others of the University, as well as by visitors. Any one desiring sample copies of these papers can, as a rule, secure them upon application to the publishers, at the addresses given.

FOREIGN EXCHANGES.

A Lavoura, Rio de Janeiro, Brazil.
L'Agricoltura Alessandrina, Alessandria, Italy.
L'Agricoltura Moderna, Milan, Italy.
Agricultural Bulletin, Straits Settlement, Singapore, East Indies.
Agricultural Gazette of New South Wales, Sidney, Australia.
Agricultural Journal of the Cape of Good Hope, Cape Town, South Africa.
Agricultural Journal of India, Calcutta.
Agricultural News, Bridgetown, Barbados, West Indies.
Boletim da Agricultura, Sao Paulo, Brazil.
Boletin del Ministerio de Agricultura, Buenos Aires, Argentina.
Bulletin de l'Agriculture, Brussels, Belgium.
Bulletin des Séances de la Société Nationale d'Agriculture de France Paris.
Bulletin of the College of Agriculture, Imperial University, Tokyo, Japan.

Bulletin of the Department of Agriculture, Kingston, Jamaica.

Chronique Agricole du Canton du Vaud, Lausanne, Switzerland.

Extrait des Travaux de la Société Centrale d'Agriculture du Department de la Seine inferieure, Paris.

Farmer's Advocate, London, Ontario.

Farmer's Advocate, Winnipeg, Manitoba.

Farming World, Toronto, Ontario.

The Field, London, England.

Garden and Field, Adelaide, South Australia.

Irish Farming World, Dublin, Ireland.

Journal für Landwirtschaft, Berlin, Germany.

Journal of the Bath and West of England Society, Bath, England.

Journal of the Board of Agriculture, London, England.

Journal of the British Dairy Farmers' Association, London, England.

Journal of the Department of Agriculture of South Australia, Adelaide, Australia.

Journal of the Department of Agriculture of Victoria, Melbourne, Australia.

Journal of the Department of Agriculture of West Australia, Perth. Australia.

Journal of the Royal Agricultural Society, London, England.

Journal of the Royal Horticultural Society, London, England.

Journal of the Sapporo Agricultural College, Sapporo, Japan.

Kgl. Landtbruks-Akademiens Handlingar och Tidskrift, Stockholm, Sweden.

Landwirtschaftliches Wochenblatt f. Schleswig-Holstein, Kiel, Germany.

Live Stock Journal, London, England.

Milch Zeitung, Leipzig, Germany.

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New Zealand Dairyman, Wellington, N. Z.

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Nor'-West Farmer, Winnipeg, Manitoba.

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Queensland Agricultural Journal, Brisbane, Australia.

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Tidsskrift for det Norske Landbrug, Christiania, Norway.

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Transactions of the Highland and Agricultural Society of Scotland, Edinburgh, Scotland.

Ugeskrift for Landmånd, Copenhagen, Denmark.
Weekly Times, Melbourne, Australia.
West Indian Bulletin, Bridgetown, Barbados, West Indies.

DOMESTIC EXCHANGES.

Agricultural Experiments, Minneapolis, Minn.
The Agricultural Student, Columbus, O.
American Agriculturist, New York, N. Y.
American Cheesemaker, Grand Rapids, Mich.
American Cultivator, Boston, Mass.
American Farm World, Augusta, Me.
American Fertilizer, Philadelphia, Penn.
American Fruit and Nut Journal, Petersburg, Va.
American Hay, Flour and Feed Journal, New York, N. Y.
American Poultry Advocate, Syracuse, N. Y.
American Sheep Breeder, Chicago, Ill.
American Shepherd's Bulletin, Boston, Mass.
American Sugar Industry and Beet Sugar Gazette, Chicago, Ill.
American Swineherd, Chicago, Ill.
American Thresherman, Madison, Wis.
Arboriculture, Connersville, Ind.
Better Fruit, Hood River, Ore.
Blooded Stock, Oxford, Pa.
Breeder's Gazette, Chicago, Ill.
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Chicago Dairy Produce, Chicago, Ill.
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Colman's Rural World, St. Louis, Mo.
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The Cotton Seed, Atlanta, Ga.
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Farm, Garden and Poultry, Hammonton, N. J.
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Farm Journal, Philadelphia, Penn.
Farm Life, Chicago, Ill.
Farm News, Springfield, Ohio.
Farm, Stock and Home, Minneapolis, Minn.
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Farm Students' Review, St. Anthony Park, Minn.
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The Farmer and Breeder, Sioux City, Iowa.
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Farmers' Tribune, Sioux City, Iowa.
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Field and Farm, Denver, Colo.
Flour and Feed, Milwaukee, Wis.
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Geflügel Züchter, Wausau, Wis.
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Hoard's Dairyman, Fort Atkinson, Wis.
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Horse-Shoers' Journal, Detroit, Mich.
Horticulture, Boston, Mass.
Hospodar, Omaha, Neb.
Hospordârske Listy, Chicago, Ill.
Illuminated World Life, Minneapolis, Minn.
Independent Farmer and Western Swine Breeder, Lincoln, Neb.
Indian School Journal, Chilocco, Okla.
Indiana Farmer, Indianapolis.
Industrious Hen, Knoxville, Tenn.
Irrigation Age, Chicago, Ill.
Jersey Bulletin, Indianapolis, Ind.
Kansas Farmer, Topeka.
Kimball's Dairy Farmer, Waterloo, Iowa.
Lincoln Freie Presse, Lincoln, Neb.
Live Stock Journal, Chicago, Ill.
Louisiana Planter, New Orleans, La.
Metropolitan and Rural Home, New York, N. Y.
Michigan Farmer, Detroit, Mich.
Minnesota and Dakota Farmer, Brookings, S. Dak.
Minnesota Horticulturist, Minneapolis, Minn.
Missouri Agricultural College Farmer, Columbia.
Modern Farmer and Busy Bee, St. Joseph, Mo.

Modern Miller, St. Louis, Mo.
National Farmer, Winona, Minn.
National Farmer and Stock Grower, St. Louis, Mo.
National Monthly Farm Press, Chicago, Ill.
Nebraska Farmer, Omaha.
New York Produce Review and American Creamery, New Y
North Dakota Magazine, Bismarck, N. Dak.
Northwest Horticulturist, Tacoma, Wash.
Northwestern Agriculturist, Minneapolis, Minn.
Nut Grower, Poulan, Ga.
Ohio Farmer, Cleveland.
Oklahoma Agriculturist, El Reno, Okla.
Orange Judd Farmer, Chicago, Ill.
Oregon Agriculturist, Portland.
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Pacific Dairy Review, San Francisco, Cal.
Pacific Fruit World, Los Angeles, Cal.
Pacific Rural Press, San Francisco, Cal.
Poultry, Peotone, Ill.
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Advocate, Amherst.
Weekly News Item, Antigo.
Eagle, Augusta.
Dodge County Farmer, Beaver Dam.
Recorder, Belleville.
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Blade, Cadott.
Rock County Banner, Clinton.
Tribune, Clintonville.
Brown County Democrat, De Pere.
Chronicle, Dodgeville.
Entering Wedge, Durand.
Leader, Eau Claire.
Independent, Elkhorn.
Tribune, Evansville.
Daily Reporter, Fond du Lac.
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Sun, Osceola.
Review, Plymouth.
Union, Prairie du Chien.
Free Press, Reedsburg.
Herald, Rib Lake.
Chronotype, Rice Lake.
Press, Ripon.
Polk County Press, St. Croix Falls.
Sheboygan County News, Sheboygan Falls.
Watchman, Shell Lake.
Washburn County Register, Shell Lake.
Monroe County Democrat, Sparta.
Door County Democrat, Sturgeon Bay.
Journal, Tomah.
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From American Aberdeen Angus Breeders' Association, Thos. McFarlane, secretary, Chicago, Ill., Herd book, v. 15, 16.

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From American Shorthorn Breeders' Association, John W. Groves, secretary, Chicago, Ill., Herd books, v. 65–68.

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From K. L. Hatch, Waterloo, Wis., 1 volume Elementary Agriculture.

From W. A. Henry, Madison, Wis., 14 volumes miscellaneous agricultural books.

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From Ed. Lübben, Rodenkirchen im Oldenburg, Germany, Das Oldenburger elegante schwere Kutschpferd, 1583–1902.

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From Wensleydale Long-wool Sheep Breeders' Association, secretary, Wynbury, Leyburn, England, Flock book, v. 18.

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From Van Brunt Manufacturing Co., Horicon, Wis., one drill.

From Garton Bros., Acton Grange, England, two 2-ounce five varieties of oats, two 1-pint samples of winter oats.

From J. B. Cherry Co., Cedar Rapids, Ia., Edwards Mot Can and bottle of B & T Culture.

From G. W. Kennedy, Thornton, Ia., Kennedy Milk Aerat

From Chriss. Hansen's Laboratory, Little Falls, N. Y., lactic culture.

From Wells, Richardson & Co., Chicago, Ill., one gallon of Dandelion Butter Color.

From Elov Ericcson, St. Paul, Minn., packages of culture.

From O. Douglas, Boston, Mass., packages of culture.

From Parke-Davis & Co., Detroit, Mich., packages of Flavorone.

From Creamery Package Manufacturing Co., Chicago, Ill., packages of Elgin butter culture.

From Jensen Manufacturing Co., Topeka, Kas., rubber gaskets for Jensen pasteurizer.

From A. H. Reid, Philadelphia, Pa., pasteurizer.

From National Chemical Co., Syracuse, N. Y., one barrel Borax Flakes.

From A. H. Irish, St. Paul, Minn., Moisture test without scale.

From Creamery Package Manufacturing Co., the loan of one Twentieth Century Milk Heater, Farrington Pasteurizer, Farrington Cream Ripener, Boyd Cream Ripener, four 24-bottle Turbine Wizard Testers, Wizard Agitator and Cream Pump, Tester, two Victor Foot Power, for separator, 20th Century Tester (12-bottle hand), Victor Tester (24-bottle turbine), two Wisconsin Curd Tests (6 bottles), 20th Century Heater No. 1, Disbrow Churn, size A-2, Hand Tester, 12-bottle size, noiseless, Hand Tester, 8-bottle size, noiseless, one Victor Skim-milk Pasteurizer, one 24-bottle Tester Wizard (for motor attachment), Starter Can (Trunnion style).

From D. H. Burrell & Co., Little Falls, N. Y., the loan of one Simplex Separator, size No. 4, Facile Tester (4-bottle hand), Facile Tester (36-bottle turbine), Facile Tester (6-bottle hand), Facile Tester (24-bottle hand), Facile Tester (24-bottle turbine), one separator bowl with flyer and extras.

From Vermont Farm Machine Co., Bellows Falls, Vt., the loan of one Agos Tester (20-bottle turbine), U. S. Separator No. 2½, one Agos Tester (12-bottle hand), one Hand Separator, style No. 5, one Hand Separator, style No. 7, one Turbine Tester, Agos (24-bottle), one Hand Separator, style No. 6.

From Sharples Separator Co., Chicago, Ill., the loan of one Triumph Test Bottle Shaker, one Sharples Separator, size 32, (with accelerator cleaner), one each of Hand Separators Nos. 4, 6, and 9.

From A. H. Barber Creamery Supply Co., Chicago, Ill., the loan of one Simplex Churn, size No. 6, one Simplex No. 1 Hand Separator, one B. & W. Heater No. 2.

From Jensen Manufacturing Co., Topeka, Kansas, the loan of one Jensen Pasteurizer and Cooler, one Hagdahl Starter Can, 30 gallons.

From De Laval Separator Co., Chicago, Ill., the loan of one Alpha Acme Separator, one Hand Separator, Baby No. 1, one Hand Separator, Baby No. 2, one Hand Separator, Daisy.

From Geo. McKerrow, Madison, Wis., Oldenburger Stutbuch, v. 1–6.

From McLaughlin Brothers, Columbus, O., Percheron Stud Books of France, 11 volumes.

From Mrs. John L. Mitchell, Milwaukee, Wis., In Memoriam, John L. Mitchell, 1849–1904.

From National Pig Breeders' Association, John Parr, secretary, Ruddington, Nottingham, England, Herd book, 2 vols.

From Oxford Down Sheep Breeders' Association, Howard Sammons, secretary, Oxford, England, Flock book, v. 18.

From Red Polled Cattle Club of America, H. W. Martin, secretary, Gotham, Wis., Herd book, v. 17, 18.

From John M. Stahl, Chicago, Ill., Farmers' National Congress, Proceedings, 1900–1902.

From Wellcome Research Laboratories, Andrew Balfour, secretary, Khartoum, Sudan, 2d report, 1906.

From Wensleydale Long-wool Sheep Breeders' Association, F. T. King, secretary, Wynbury, Leyburn, England, Flock book, v. 18.

From Creamery Package Manufacturing Co., Chicago, Ill., one 1907 model Wisconsin Curd Test.

From Nitrate of Soda Propaganda, New York City, 400 pounds of nitrate of soda.

From Borden's Condensed Milk Co., New York City, one case each of sweetened and unsweetened condensed milk.

From United States Sugar Company, Madison, Wis., 60 pounds each of R. & G. Original Kleinwanzleben and Braune Elite sugar beet seed.

From A. S. Nottoden, Nottoden, Norway, two five-pound samples of calcium nitrate and sodium nitrite.

From A. M. Ferguson, Sherman, Texas, a sample of Texas red rustproof winter oats.

From Parke Davis & Co., Detroit, Mich., seven cultures of bacteria.

From Prof. E. G. Smith, Beloit, Wis., one lantern slide.

From A. J. Woodman, Urbana, Ill., one bushel Country Gentleman sweet corn.

From W. P. Bussey, Omro, Wis., one bushel oats.

From John Van Loon, La Crosse, Wis., ten ears of corn.

From Ulrich Seed Co., Atlantic, Ia., seed corn tester.

From Van Brunt Manufacturing Co., Horicon, Wis., one double disc drill.

From Garton Bros., Acton Grange, England, two 2-ounce samples of five varieties of oats, two 1-pint samples of winter oats.

From J. B. Cherry Co., Cedar Rapids, Ia., Edwards Mother Culture Can and bottle of B & T Culture.

From G. W. Kennedy, Thornton, Ia., Kennedy Milk Aerator.

From Chriss. Hansen's Laboratory, Little Falls, N. Y., packages of lactic culture.

From Wells, Richardson & Co., Chicago, Ill., one gallon of Dandelion Butter Color.

From Elov Ericcson, St. Paul, Minn., packages of culture.

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From Jensen Manufacturing Co., Topeka, Kansas, the loan of one Jensen Pasteurizer and Cooler, one Hagdahl Starter Can, 30 gallons.

From De Laval Separator Co., Chicago, Ill., the loan of one Alpha Acme Separator, one Hand Separator, Baby No. 1, one Hand Separator, Baby No. 2, one Hand Separator, Daisy.

From McKinnon & Co., Sheboygan Falls, Wis., the loan of one Combination Cheese Press.

From Hastings Industrial Co., Chicago, Ill., the loan of one National No. 14, one National No. 12.

From Milo D. Beach, Litchfield, Conn., the loan of one Triumph Test Bottle Shaker.

From Cornish, Curtis & Green, Ft. Atkinson, Wis., the loan of one American Butter Printer.

From Fuller & Johnson Mfg. Co., Madison, Wis., the loan of one Gasoline Engine, 3½ horse power.

From International Harvester Co., Madison, Wis., the loan of one Cream Harvester, one Hand Separator, Dairy Maid, one Hand Separator, Midget, one Gasoline Engine, 3 horse power.

From Melchior, Armstrong & Dessau, New York City, the loan of one Perfect Gloria Separator.

From Empire Separator Co., Bloomfield, N. J., the loan of one Hand Separator, No. 1-A, one Hand Separator No. 1-B., one Hand Separator No. 2-B.

From Exhaust Steam Purifier Co., Berlin, Wis., the loan of one Pump, box fittings, and purifier.

From Montgomery, Ward & Co., Chicago, Ill., the loan of one Hand Separator, Golden Cream Harvester.

From Sears, Roebuck & Co., Chicago, Ill., the loan of one Hand Separator, Improved Economy.

From Marshfield Churn Co., Marshfield, Wis., the loan of one Hand Churn.

From Perfection Anti-Dirt Pail Co., Albert Lea, Minn., the loan of one Perfection Milk Pail.

From Farm Machine Publishing Co., St. Louis, Mo., 1 vol. Farm Machinery.

From Implement Trade Journal, Kansas City, Mo., 1 vol. Trade Journal.

From Threshermen's Review, St. Joe, Mich., 1 vol. Threshermen's Review.

From Gas Power, St. Joe, Mich., 1 vol. Gas Power.

From Aspinwall Mfg. Co., Jackson, Mich., the loan of one potato planter and one potato cutter for instructional purposes.

From American Plow Co., Madison, Wis., one sixteen inch sulkey plow for instructional purposes.

From Alamo Mfg. Co., Hillsdale, Mich., one 18 horse power gasoline engine for instructional purposes.

From J. D. Adams Co., Indianapolis, Ind., one "Road King," road grader.

From Baker Mfg. Co., Evansville, Wis., one 4 horse power vertical gasoline engine.

From Bateman Mfg. Co., Grenlock, N. J., the loan of one potato planter for instructional purposes.

From Bateman Mfg. Co., Grenlock, N. J., the loan of one garden wheeled hoe and planter complete.

From Bradley Mfg. Co., Bradley, Ill., the loan of one corn planter and exhibition platform for instructional purposes.

From the Bruley Steel Fence Post Co., Milwaukee, Wis., the loan of six indestructible fence posts for instructional purposes and two rods of woven wire.

From F. H. Battles, Rochester, N. Y., the loan of two swinging cow stanchions for instructional purposes.

From J. I. Case Plow Co., Racine, Wis., the loan of one corn planter and exhibition platform for instructional purposes.

From Champion Potato Machinery Co., Hammond, Ind., the loan of one potato planter and one potato cutter for instructional purposes.

From W. B. Crumb, Forestville, Conn., the loan of two swinging cow stanchions for instructional purposes.

From J. R. Christiensen, Oshkosh, Wis., the loan of one brick silo model for instructional purposes.

From Deere, Mansur & Co., Moline, Ill., the loan of one corn planter and exhibition platform for instructional purposes and one exhibition corn planter shank.

From John Deere Plow Co., Moline, Ill., the loan of one new Deere sixteen-inch sulkey plow, one new Elk corn cultivator, and one new Deere corn cultivator.

From Emerson Mfg. Co., Rockford, Ill., the loan of one disc gang plow, one No. 10 corn planter, one fourteen-inch mold board gang plow, and one No. 5 standard mower, for instructional purposes.

From Fuller & Johnson Mfg. Co., Madison, Wis., the loan of one corn planter, and one 6 horse power open jacket gasoline engine for instructional purposes.

From Gilson Mfg. Co., Port Washington, Wis., one 2½ horse power air cooled gasoline engine for instructional purposes.

From Hayes Pump & Planter Co., Galva, Ill., the loan of one corn planter for instructional purposes.

From Hunt, Helm, Ferris Co., Harvard, Ill., the loan of one swinging cow stanchion for instructional purposes.

From Johnson Field Mfg. Co., Racine, Wis., one grain cleaning mill complete for instructional purposes.

From International Harvester Co., Chicago, Ill., the loan of one 6 horse power portable gasoline engine, one 6 horse power stationary gasoline engine, one 3 horse power vertical gasoline engine, and one 2 horse power sectional gasoline engine, for instructional purposes.

From Deering Division the loan of one six-foot Deering grain binder.

From Champion Division the loan of one six-foot Champion binder.

From McCormick Division the loan of one six-foot McCormick binder, one binder attachment, and one four row corn shredder.

From Milwaukee Division the loan of one six-foot Milwaukee grain binder.

From Osborne Division the loan of one six-foot Osborne grain binder for instructional purposes.

From Janesville Machine Co., Janesville, Wis., the loan of one corn planter and exhibition platform for instructional purposes.

From Kemp Mfg. Co., Ft. Atkinson, Wis., one "James" cow stall for instructional purposes.

From J. I. Case Threshing Machine Co., Racine, Wis., the loan of one 20 horse power traction engine, one 15 horse power traction engine, one corn husker and shredder, one water tank, one tank pump and suction hose, and one drive belt for instructional purposes.

From Louden Machine Co., Fairfield, Ia., the loan of four swinging cow stanchions for instructional purposes.

From Minneapolis Silo Co., Minneapolis, Minn., the donation of one section of stave silo for instructional purposes.

From Manson Campbell Co., Detroit, Mich., the loan of one Chatham fanning mill and corn grader for instructional purposes.

From MacDonald Bros., Pleasant Hill, Mo., the loan of one four ton wagon platform scale for instructional purposes.

From Northern Electric Mfg. Co., Madison, Wis., one 10 kilowatt generator, and one 10 horse power motor, for instructional purposes.

From Newton Co., Batavia, Ill., the donation of one Newton improved animal tie for instructional purposes.

From E. Prescott, Boston, Mass., the loan of two swinging cow stanchions for instructional purposes.

From Robt. Rom Co., Milwaukee, Wis., one No. 5 economical hot air engine, manufactured by Smith & Co. of Chicago, for instructional purposes.

From Reliance Iron Engine Co., Racine, Wis., one 6 horse power gas engine, for instructional purposes.

From O. H. Robertson, Forestville, Conn., the loan of two swinging cow stanchions for instructional purposes.

From D. M. Sechler Carriage Co., Moline, Ill., the loan of one Black Hawk corn planter and exhibition platform, and one corn planter shank, for instructional purposes.

From Stowell Mfg. Co., Milwaukee, Wis., one No. 3 hay carrier and fifteen feet of steel track.

From Simplicity Tank Heater Co., Sparta, Wis., the loan of one Simplicity tank heater for instructional purposes.

From Temple Pump Co., Chicago, Ill., one 5 horse power double cylinder kerosene burning engine for instructional purposes.

From Van Brunt Mfg. Co., Horicon, Wis., the loan of one seventeen disc six inch drill, one shoe and bar, and one sample feed gate for instructional purposes.

From Wiard Plow Co., Batavia, N. Y., the loan of one bean harvester for instructional purposes.

From Walter A. Wood Harvesting Machine Co., Hoosick Falls, N. Y., the loan of one six-foot grain binder for instructional purposes.

From Wood Automatic Corn Planter Co., Milwaukee, Wis., the loan of one automatic planter attachment for instructional purposes.

From F. & J. H. Welcher, Newark, N. J., the loan of two swinging cow stanchions for instructional purposes.

FINANCIAL STATEMENT

*The Wisconsin **Agricultural Experiment Station, i***
the United States appropriations.

1906-1907.	
To receipt from treasurer of the United States as per appropriations for the year ending June 30, 1907, under the acts of Congress, approved March 2, 1887, and March 16, 1906	$22
By salaries	
By labor	
By publications	
By postage and stationery	
By freight and express	
By heat, light, and water	
By chemical supplies	
By seeds, plants, and sundry supplies	
By feeding stuffs	
By library	
By tools, implements, and machinery	
By furniture and fixtures	
By scientific apparatus	
By live stock	
By traveling expenses	
By contingent expenses	
By building and repairs	
	$2

We, the undersigned, duly appointed auditors of the corporation
that we have examined the books and accounts of the Wisconsin A
ment Station for the fiscal year ending June 30, 1907; that we have f
kept and classified as above, and that the receipts for the year fr
the United States are shown to have been $22,000, and the correspon
$22,000, for all of which proper vouchers are on file and have been
found correct.

And we further certify that the expenditures have been solely f
forth in the acts of Congress approved March 2, 1887, and March 1

(Signed) MAGNUS SWEN
L. S. HANKS,
W. J. MCELRO
Ex

ATTEST:
M. E. MCCAFFREY,
Custodian.

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REPORT OF THE DIRECTOR

OF THE

Agricultural Experiment Station

1907-1908

REPORT OF THE DIRECTOR.

H. L. RUSSELL.

The Twenty-Fifth Annual Report of the Agricultural Experiment Station of the University of Wisconsin is herewith presented, covering the fiscal year ended June 30, 1908. This report marks the completion of a quarter of a century of experiment station effort in this state. The continuity of purpose which has marked the activities of this Experiment Station throughout its entire career is largely attributable to the fact that it has not been subject to the frequent changes in administration that have characterized so many other such institutions. From the organization of this Station, until last year, its direction has been under Professor William Arnon Henry, who, by reason of the condition of his health, was obliged to retire from administrative work last year. In the Twenty-Fourth Annual Report record was made of the services of Professor Henry, and the appreciation of the Regents of the University of Wisconsin expressed in the form of an engrossed resolution. In view of the fact that this report marks the completion of the quarter centenary of this institution, it seems proper again to refer to the distinguished services which he has rendered in the development of Wisconsin's Agricultural Experiment Station.

ADMINISTRATION.

The teaching work of the College performed at the University and the many lines of work carried on throughout the state-at-large, are very rapidly growing, and are requiring an increased amount of attention. The increase in number of students taking college work is exceedingly rapid, not only in the Short Course, which now numbers over 450, but in the regular full time University courses. Much of the work done throughout the state is of the nature of extension of the re-

REPORT OF THE DIRECTOR.

H. L. RUSSELL.

The Twenty-Fifth Annual Report of the Agricultural Experiment Station of the University of Wisconsin is herewith presented, covering the fiscal year ended June 30, 1908. This report marks the completion of a quarter of a century of experiment station effort in this state. The continuity of purpose which has marked the activities of this Experiment Station throughout its entire career is largely attributable to the fact that it has not been subject to the frequent changes in administration that have characterized so many other such institutions. From the organization of this Station, until last year, its direction has been under Professor William Arnon Henry, who, by reason of the condition of his health, was obliged to retire from administrative work last year. In the Twenty-Fourth Annual Report record was made of the services of Professor Henry, and the appreciation of the Regents of the University of Wisconsin expressed in the form of an engrossed resolution. In view of the fact that this report marks the completion of the quarter centenary of this institution, it seems proper again to refer to the distinguished services which he has rendered in the development of Wisconsin's Agricultural Experiment Station.

ADMINISTRATION.

The teaching work of the College performed at the University and the many lines of work carried on throughout the state-at-large, are very rapidly growing, and are requiring an increased amount of attention. The increase in number of students taking college work is exceedingly rapid, not only in the Short Course, which now numbers over 450, but in the regular full time University courses. Much of the work done throughout the state is of the nature of extension of the research work of the Station directly to the people of the state, and is therefore of utmost importance in the development of our agriculture. It is becoming more and more necessary as these respective lines grow that they be more completely organized and correlated. This coming year it is to be hoped that the legislature will make proper provision for the extension work so that it will be possible for those engaged in the distinctively research work of the Station to give their time more uninterruptedly to research problems, the successful accomplishment of which demands freedom from other regular duties.

CHANGES IN STATION PUBLICATIONS.

The work of the Experiment Station is primarily designed to extend the boundaries of agricultural science. While a leading part is always concerned with problems that are of more or less immediate practical value, a not inconsiderable amount of research is quite technical in character, and often is not susceptible of immediate presentation in a form suitable for general distribution to farmers. Suitable differentiation of these two types of work has not heretofore been made, and after careful consideration it has been deemed advisable to change the method of issuing the publications of this Experiment Station. Heretofore two series of publications have been issued:

1. Bulletins issued at frequent and irregular intervals in editions of varying size, describing some definite single phase of Station work, usually in popular form.
2. An Annual Report of 15,000 copies, containing, in the main, the technical and scientific work of the Station, as well as articles of the more popular class. Naturally a not inconsiderable portion of this latter publication is of such a character as to be of but small interest to the practical farmer, however valuable it may be to the scientific student of agriculture. The expense of such large editions is not inconsiderable and after careful consideration, it has been deemed advisable to alter materially the plan of issuing the publications.

Beginning with this fiscal year, the following changes will be made: More emphasis will be given to the presentation of the practical results obtained from the experimental work, and these will be presented as short, illustrated bulletins prepared in popular form. It is to be hoped that these may be much more widely distributed than has heretofore been the case, so as to bring the results of the Station's activities in the best possible form to the largest number of persons interested therein. The more technical and scientific findings that are merely of value to the scientific worker will be published separately in a new series of bulletins, entitled "Research Bulletins," which will be issued in limited editions and not given general distribution. These bulletins will present scientific data of importance to those who are engaged in studies in similar lines, but persons not actually engaged in scientific work who may desire these technical publications may obtain them, so long as the the supply is available, upon application to the Station.

In order that these results may be brought together in permanent form, there will be issued at the end of each fiscal year, an Annual Report, which will be made up of two parts:

Part 1, the Director's Report, which will include a general summary of all the activities of the Station in its various lines, together with such financial and other statements as may be required by law. This report will also be issued in bulletin form and given general distribution.

Part 2, the Research Bulletins that have previously been issued from time to time during the year. These two parts will be bound in paper or in cloth, as prescribed by law, and distributed to libraries, public institutions, etc., for historical purposes, and to such persons who are especially desirous of maintaining a file of the research work of the Station. It is believed that this new method will economize in the matter of public printing and distribute the results of experiment station effort in the most economical way to those interested therein.

CHANGES IN STATION PERSONNEL.

Only a very few changes are to be recorded in the personnel of the Station staff for this year. Mr. George A. Olson, of the Agricultural Chemistry Department severed his connection with the institution this year, and W. A. Brannon was appointed in his place as Assistant in Feed and Fertilizer Inspection in the analytical laboratory. Mr. C. S. Knight, Assistant in Feed and Fertilizer inspection resigned in January, 1908, to accept a position in the Kansas Agricultural College, and his place was filled by the appointment of Mr. George Hine. Mr. R. R. Marshall was appointed Assistant in the Soils Department in connection with field experiments.

PERMANENT IMPROVEMENTS AND ADDITIONS TO RESOURCES.

The College of Agriculture associated with this Experiment Station has always been more or less handicapped in the matter of land, on account of the fact that the University is located within the city limits, and is limited to a very considerable extent by its situation on the shores of Lake Mendota. Some ten years ago a tract of 160 acres of land, known as the Hill Farm, lying two miles west of the University, was purchased for the use of the Agricultural Department. To this an addition of 60 acres was later made, and this last year opportunity presented itself to secure a favorable option on a 70-acre tract lying immediately adjacent to the original farm. This was leased for a period of five years, with the privilege of buying the same at a fixed price within that time. These lands are urgently needed to give opportunity for the necessary expansion of the work of the Animal Husbandry Department, and for the production of pure-bred grains for dissemination throughout the state. With the constant expansion of the University, more and more of the original farm which has been used for experimental purposes since the inauguration of the Station, will be required for general University use, and very soon it will be necessary to replace these lands by additional purchases, which can only be made to the westward of our present holdings.

During this year one new building has been authorized by the Board of Regents, and there is now in process of construction a Stock Pavilion which is expected to be finished during the coming summer. This Stock Pavilion contains a large amphitheater having a seating capacity of 2,000, and will give exceptionally good facilities for the handling of large gatherings. This building will include, in addition to the amphitheater, which can be divided off into sections for stock judging purposes, ample quarters for housing the horses belonging to the different departments, hospital and veterinary facilities, offices for the farm superintendent, and several offices for various members of the Animal Husbandry Department.

In addition to this building the surplus saved in the operation of the Agricultural College for the last year has been used in constructing three new greenhouses for the soil departments, that have been practically rebuilt; also an 80-ton stave silo at the Dairy Barn, which is used for the making of silage for summer use. This last season has given us a splendid opportunity to test the value of this method of feeding dairy animals, and the milk flow of the University herd has never been maintained so high during the drought of summer as has been the case this year.

ADDITIONS TO FINANCIAL RESOURCES.

The passage of the Adams and the Nelson acts by Congress is increasing the amounts of money which are granted from the national treasury for the further development of agricultural experimentation and education. In addition to the Hatch act, which was the original foundation of the agricultural experiment stations, the Adams act, gives us this year $11,000 additional, the money so received to be applied only "in paying the necessary expenses of conducting original researches on experiments bearing directly on the agricultural industry of the United States." It is for the "more complete endowment and maintenance of the experiment stations, presupposing the provision of a working plant and administrative officers." This fund, as indicated, can only be used in prosecuting the strictly scientific work of the experiment stations, and unquestionably will do more toward elevating the character of the scientific work of these organizations than any other factor. Under the Nelson act, passed by Congress on March 4, 1907, there was appropriated to each agricultural college a gradually increasing fund which is now $10,000, which is designed to supplement the Morrill act of 1862, on which all of the land grant colleges were founded. These funds are given by the federal government to aid and stimulate the development of agriculture, and the moral obligation imposed upon each state receiving the same is to supplement such fund so far as it is within its power. This, in the case of the State of Wisconsin, has been made by gradually increasing appropriations devoted to the work of the Agricultural College. The work of the College is so closely coordinated between experimental research in the Experiment Station, teaching in the College proper, and the extension service which is carried on throughout the state, that it is very difficult to determine the exact cost of the administration of these respective lines of work, but within the last few years, an increasing portion has been devoted to various types of demonstrative work which have been in progress throughout all portions of the state. The time has come when this type of work should be more completely organized and special provision made for its further development.

RESEARCH WORK OF THE EXPERIMENT STATION.

It is exceedingly difficult to measure the net results of the experimental work of any institution, and record how valuable and fruitful its energies have been. The teaching work expresses itself more concretely, and may be compared in definite mathematical terms as to the number of students who are instructed. For some years the teaching demands of the College, occasioned by the rapid growth of the long course, have increased so rapidly that it has been quite impossible to adjust the staff of the College as at present organized, to these conditions. For the best grade of research work, uninterrupted time in periods of considerable length is necessary, and it has been increasingly difficult for members of the staff to secure this. Notwithstanding these drawbacks, a considerable amount of important scientific work has been accomplished, only a portion of the results of which has been published.

Under the supervision of the federal department of agriculture, of the funds expended under the Adams act, a much closer control as to the nature of the scientific work carried on is being made than was formerly the case. Projects must be submitted in advance to the Office of Experiment Stations, and approved by them before being authorized. It is evident that too careful consideration cannot be given to the planning of work beforehand, and the inauguration of this method of control will doubtless prove to be highly beneficial. During the last fiscal year this system of detailed projects has been extended to all of the research work of this Station.

GENERAL PROGRESS OF RESEARCH WORK.

Many projects are under consideration by members of the various departments which are not brought to a state of final completion within the limits of any particular year. In many instances research work of this character will frequently cover a period of a number of years, and inasmuch as the results are not in such form as to permit of definite conclusions being drawn, it is frequently inadvisable to present a fragmentary account of such researches. It therefore follows that no report of the Experiment Station can give anything like an adequate account of the activities of the staff along the line of research and investigation. The results which have reached final form will be presented through the usual mediums, either as research or popular bulletins and therefore do not need to be considered in this connection. It may, however, be desirable to present a progress report of certain phases of work which have been undertaken, so as to indicate somewhat the scope of the station activities.

An important joint investigation which has been in progress for the last two years, between the Agricultural Chemistry and Animal Husbandry Departments, is a series of physiological studies on animal nutrition.

ROLE OF PHOSPHORUS IN DEVELOPING SWINE.—So far, emphasis in scientific nutritional studies has been placed mainly on the rôle of organic substances in the animal body—fats, proteins, or carbohydrates. It is equally important that attention should be directed to the part played by other food constituents, more particularly the inorganic elements. In these studies phosphorus has been under consideration, and Professors Hart and McCollum, in cooperation with Professors Humphrey and Fuller, have made important discoveries. Pigs were fed on a depleted phosphorus ration alone, also one supplemented with inorganic phosphates. Up to a certain point the phosphorus-low ration permitted apparently normal tissue development. In the course of some weeks, however, physiological disturbance became evident, and loss of weight and final collapse took place. Prior to this metabolic disturbance, the phosphorus content of tissues and body fluids remained parallel with that of control animals, in spite of the low phosphorus intake in the food. Such maintenance was traced to a withdrawal of the phosphates from the skeleton of the animal, as was indicated by the low ash content of the bones. Where physiological disturbance was observed, loss of appetite occurred, locomotion became impossible, and a gradually deepening stupor preceded the final collapse of the animal. Where the symptoms were not too pronounced, the animals recovered when supplied with feeds containing the organic phosphorus. Pigs fed from the first on depleted phosphorus rations supplemented with inorganic phosphates, such as ground phosphate rock (floats) made as vigorous growth as animals receiving organic phosphorus compounds.

While these experiments bring out certain facts of scientific importance, they open up a very promising field of practical investigation, as to the possibility of substituting the cheaper inorganic phosphates for the more expensive forms of phosphorus found in ordinary feeds. The results here presented will appear in a research bulletin in the near future.

CHEMICAL STUDIES ON LAXATIVE EFFECT OF WHEAT BRAN.—Feeders have long recognized the laxative effect which wheat bran exerts upon an animal fed this material. This feed is known to contain large quantities of an organic phosphorus compound known as phytin, and metabolism experiments made on milch cows fed upon rations rich in bran, and therefore in phytin, and also where the phytin had been removed by washing, demonstrated that the laxative effect of bran was attributable to the presence of this substance. In these chemical studies so far it has been impossible to dissect phytin and determine whether this pharmacological effect is due to the basic substances present or to the compounds of phosphorus.

VALUE OF CHEMICALLY BALANCED RATIONS MADE FROM SINGLE VS. MIXED PLANT SOURCES.—The chemist has materially advanced the science of feeding by determining the relative proportion of carbohydrates and protein needed in compounding a suitable ration for developing animal life. Practical experience has demonstrated that the most profitable ration should contain a certain ratio of these substances, but more emphasis has been laid upon the results of chemical analysis than upon the possible physiological effect of the different constituents in feeding stuffs from different plant sources. Is the proteid or starch of one cereal grain identical in its physiological effect with that of other grains? For nearly two years the Animal Husbandry and Chemical Departments have been studying this question. Sixteen young calves have been reared upon a balanced ration composed of nutrients from single as well as mixed plant sources. By the usual methods of chemical analysis these rations are absolutely identical, and different lots of animals have been fed upon corn, wheat, and oats, respectively, also a combination of all three nutrients. From an early stage marked physiological differences appeared. The different groups have reached a stage of physiological maturity at widely differing times, and it is apparent at this writing that the animals receiving a ration made from mixed grains are more normal than some of those receiving "single" plant rations. These experiments will be continued long enough to place all of the animals under the strain of reproduction, so that the effect of the nutritive method may be continued throughout a complete cycle.

MILKING MACHINE EXPERIMENTS.—The heavy burden placed upon the dairy industry in the necessity of hand milking dairy animals has been such as to lead numerous inventors to attempt to solve the problem of milking by machinery. Within the last few years several machines have been placed upon the market for which high claims have been made as to their efficiency in reducing this process to a mechanical basis. Investigations have been under way at this station with one of these machines for a period of a year and a half, and a large body of data has been accumulated which gives a good foundation for conclusions of value. The results of this study will soon appear in bulletin form, and need not be detailed here.

From a mechanical point of view, it is evident that a single operator can handle three machines with ease, but the successful use of the cow milker requires more than an ordinary degree of care, and it may be expected that dissatisfaction may result where careless handling obtains. No appreciable ill effect was noted on the animals, and almost all soon took kindly to the machine, and after a few weeks duration were as cleanly milked by machine as by hand, although occasional individuals were more resistant. It is, of course, absolutely necessary that the apparatus be kept in a perfectly clean condition, and where this is done, the sanitary condition of the milk supply can be as satisfactorily maintained as in hand milking.

NUTRITION STUDIES ON THE DAIRY HERD.—Studies in nutrition on the influence of medium and high protein on milk secretion have been continued this year by Professors Humphrey and Woll. A three-year period on the use of high protein was completed in 1906, and for two years the herd has been handled on a medium protein basis. Another year's results will give a broad basis for comparative studies as to which is best for the economic production of butter fat.

The improvement of our University herd continues. Seven cows qualified this last year for the advanced registry class. One of the Jerseys, Double Time, now nine years old, this year made the record of the second best of this breed in America. In a 7-day test she produced 410.9 pounds of milk, containing 20.388 pounds of butter fat, lacking less than 2 ounces of equaling the best producer of her breed.

DAIRY FACTORY TESTS.—During this year two new methods have been devised at this Station for the testing of milk under factory conditions. The Hart casein test, described in Bulletin 156, is the first simple factory method that has yet been devised for the analysis of milk with reference to its casein content. A new moisture test, for the determination of water in butter, described in Bulletin 154, gives another rapid method for the estimation of the moisture content of butter.

Six different types of tests have been devised and applied more or less generally in dairy factory operations. These are as follows: the Babcock test, for the determination of fat; the Wisconsin curd test, for the detection of taints; the acid test, for the determination of acidity of milk and cream; the rennet test, used to indicate the proper maturity of milk in the process of cheese making; the moisture test, for the determination of the water content of butter, and the Hart test, for the estimation of the casein. It is worthy of note that representatives of five of these different types of tests have been perfected by members of the staff of this Experiment Station, and that three of the five tests are practically the only methods in use for their respective purposes.

PLANT BREEDING.—Professor R. A. Moore has been working for several years on pedigreed barleys to secure a type that will be uniform in quality. He has succeeded in developing strains that are an improvement on the Manshury and Oderbrucker varieties, and this year 50 acres of these pedigreed types were grown, so that limited amounts of seed will be available for distribution this coming year. Work is also in progress on other varieties of small grains; buckwheat, peas, and forage crops are also under investigation.

Professor Sandsten is at work on the subject of selection of improved strains of potatoes. Attempts are being made to secure, if possible, varieties that possess increased resistance toward the blight. The potato industry of this state has already reached a value of about $8,000,000, and is capable of great extension. The average yield is yet small, only about 90 bushels per acre. By the use of improved seed and better cultural methods, it should be increased to at least 150 bushels per acre. The Horticultural Department has also had hybridization experiments on tobacco under way for several years. Several crosses have been secured, and two or three new varieties of seeming special excellence have been developed. Not only are the leaves larger and better shaped, but the quality, texture, and size of vein are greatly improved. From the season's work this year a small quantity of seed has been secured, which will be distributed in a few places this coming year. If this should succeed under the varying conditions of ordinary farm culture, we shall arrange for the growing of this seed in larger quantities.

TOBACCO CURING.—By improper methods of curing, large sums of money are now annually lost. Much of the deterioration in the quality of tobacco happens after the crop is harvested and in the shed, and studies have been made by Professor Sandsten of the Horticultural Department to see if it is not possible to control the conditions under which tobacco is shed cured. A model shed was erected several years ago sufficiently large to accommodate the crop from about 2 acres. This shed was equipped with steam pipes, and a traction engine was used for furnishing the heat when needed. By the application of this method a much more uniform color was obtained, and the curing of the tobacco rendered independent of variations in weather conditions. In the crop so treated practically no loss resulted from the usual troubles which occur in curing.

FERTILIZERS IN TOBACCO CULTURE.—It is customary in Wisconsin to use large quantities of stable manure on tobacco lands, and but little experimental work has been done with the use of commercial fertilizers. Experiments carried on in Columbia, Crawford, and Rock counties (representing different types of tobacco soils in the state) indicate that under present conditions the use of commercial fertilizers cannot be considered as advisable, for while there is an increased yield from the liberal use of such fertilizers. such increase is not commensurate with the outlay incurred. It is also of importance to note the relation of these commercial fertilizers to the quality of the tobacco, especially as to its burning properties. Fertilizers free from chlorine were found not to exert any detrimental effect upon this quality.

EXPERIMENTS IN CHEESE MANUFACTURE.—Th
work in cheese making with the United States I
Agriculture has been continued and extended du
year. This work has been under the immediate c
fessor Sammis of the Dairy Department, although
logy and Chemistry Departments have assisted.
vision of the United States Department of Ag
three experts stationed here working in conjunc
staff on these problems. The experiments this y
made with particular reference to the use of pas
and while not completed, it appears that milk ma
155–160 degrees F. in a continuous pasteurizer,
large measure, bacterial development), and then
standard degree of acidity by the use of commer
addition, then, of a properly selected starter supp
sary organisms and the further manufacturing
be successfully carried out in a uniform manner.

The pasteurized cheese so far made is unifo
flavor, although the control cheese is often tainte
higher yield is obtained, due to the saving, in pa
the fat, and a somewhat higher moisture content
This process has not yet passed the experimental
is not yet certain what the effect of matured cur

ORIGIN OF CHEESE FLAVORS.—Studies on origi
cheese have been continued by Professors Hastin
They have approached this subject from an entir
of view, and are studying the influence which
such as sugar, exert on production of flavor. In
succeeded in obtaining results that promise well.

INFLUENCE OF SOIL TREATMENT ON PHOSPHORU
SOILS.—Professors Whitson and Stoddart have s
fluence of soil treatment on the phosphorus conten
the conditions influencing the availability of phos
fessor Stoddart has devised a new method which
separation of the different phosphate salts from e
the field results already show that the combina
phates with humus sometimes renders phosphat
to plants. Ninety-five per cent of the total loss
acid on fields continuously cropped, with little
is accounted for by the crops which are removed.
ing copious amounts of fertilizers, such as hea

tobacco soils, receive much more phosphoric acid than the crop removes, but this phosphate excess does not apparently accumulate in the soil.

STUDIES ON DIFFERENT SOIL TYPES.—The Soils Department has been carrying on experiments on the restoration of worn out light soils at Sparta, and by a rotation of crops, and the utilization of legumes, have succeeded in improving materially the quality of the soil. Lupines and serradella are found to be much better adapted to these highly exhausted lands than any of the clovers.

Very favorable results have been obtained upon the heavy red clays at Ashland and Superior by tile drainage, and both cereal and forage crops this year show a heavy growth, indicating the beneficial effect of drainage; where phosphate fertilizers have supplemented manure, improved results were also secured.

Experimental work on marsh soils at four stations indicates that these soils as a class do not need nitrogen fertilizers or lime, but that they are deficient in both phosphate and potash. At Marinette this year extremely heavy crops of mixed timothy and alsike clover were secured, the yield on soils where phosphates and potash were used being two to three times the yield of control areas. This means much for central and northern Wisconsin where large areas are well adapted to this crop. The problem of these peat lands is, however, not always a simple one, as at Phillips soils were found that did not respond readily to this treatment because nitrification is not sufficiently active to insure satisfactory crops.

NEW METHOD OF CRANBERRY CULTURE.—Further experience with the new method of cranberry culture for Wisconsin (recommended by Professor Whitson) consisting of sanding the beds, thorough drainage, and clean cultivation, indicates that the frost problem in cranberry culture is now practically solved. The temperature of our experimental bogs, which have been improved in this way, is from 6–10 degrees F. higher than the overlying air, so that a frost as low as 26 degrees F. can be successfully passed. It now remains for those engaged in this industry to adapt themselves to these new conditions to secure immunity from the destructive summer frosts. In cooperation with the Bureau of Entomology of the United States Department of Agriculture, special emphasis has been given this season to the study of insect ravages, and important results in the life

history of the more destructive insects determi
experiments, for the control of insect pests, have
successful.

BACTERIOLOGICAL STUDIES ON MILK.—Professo
studied a peculiar type of lactic acid produ
capable of forming abnormally large quantities
Ordinarily about 0.8% of acid is produced by th
tation, but this type of organism produces from
They also grow well at high temperatures, from
grees F. This class of bacteria do not seem to
by other bacteriologists, although he finds them
uted in milk.

FIXATION OF NITROGEN BY MICRO-ORGANISMS.—
has been studying the conditions affecting
tion by that peculiar type of bacteria known
and finds that the quantity of nitrogen in the
materially increased. The rate of fixation is cl
upon the amount of carbon available for produc
as well as the source of the carbon supply.

STRUCTURE OF THE UDDER.—It is indeed surp
periment stations have not given more considerat
structure of the cow's udder. While this organ h
from the purely scientific point of view, generall
than cattle have been chosen as illustrations.
the Bacteriological Department, has been eng
year in a miscroscopic study of the udder in
of development. Microscopic preparations of
actively secreting and "discharged" udder glan
instructive idea of the relation of milk secretion
logical activity of cells of this organ.

PUBLICATIONS ISSUED.

During the fiscal year covered by this report,
issued, in addition to the Annual Report of 437
preceding year, 11 regular, and 2 special bulle
ing 920 pages. These have been printed in e
from 2,000 to 50,000 copies, the larger editions
to supply the call for such bulletins as are likel
eral demand for a considerable period of time.

No.	Title.	Author.	Size of edition.	Number of pages.
153	Portable Hog Houses	Fuller and Ocock	30,000	28
154	A Creamery Method for the Determination of Water in Butter	Farrington	10,000	19
155	The Distribution of Stallions in Wisconsin	Alexander	8,000	172
156	A Simple Test for Casein in Milk and its Relation to the Dairy Industry	Hart	40,000	22
157	Licensed Commercial Feeding Stuffs, 1907	Woll and Olson	18,000	54
158	The Grade Stallion Situation in Wisconsin	Alexander	50,000	35
159	The Cranberry Insects in Wisconsin	Hardenberg	2,000	23
160	Tests of Dairy Cows, 1906-7	Woll and Harris	18,000	39
161	Grains and Forage Crops for Northern Wisconsin	Moore and Delwiche	10,000	23
162	Rusty Cans and Their Effect upon Milk for Cheesemaking	Olson	30,000	12
163	Licensed Commercial Fertilizers, with List of Licensed Feeding Stuffs, 1908.	Woll and Olson	18,000	31
	In addition to the above publications in the regular series, two special bulletins on the following topics have been prepared. These were especially designed for distribution at the Farmers' Institutes this last year, as these subjects were given especial consideration at most of these meetings.			
	Tuberculosis of Domestic Stock and its control	Russell	60,000	6
	The Seeding, Growing, and Curing of Alfalfa	Moore	60,000	12

A brief summary of the bulletins of the regular series is herewith presented.

BULLETIN 153. PORTABLE HOG HOUSES.—This bulletin contains plans and specifications for the construction of portable hog houses of the small and the large types. The designs are such as can be followed by most farmers, involving only simple methods of construction with materials that are readily available. These suggestions are based upon experiences with such hog houses on the University farm and at other places. The advantages of the portable house mentioned are: it is cheap and easily built; can be readily moved; is adapted to the needs of the general farmer and the breeder of pure-bred stock; and is the most natural and sanitary system of housing swine. The styles illustrated and described are the A-shaped portable house, the small shed roof house, the large shed roof h large central hog house.

BULLETIN 154. A CREAMERY METHOD FOR THE TION OF WATER IN BUTTER.—Last year the Dairy perfected a simple factory method for the determi amount of moisture in butter. This question especial importance since the passage of the nation law, which construes butter adulterated, and ther when it contains more than 16 per cent of water. gives instructions relative to sampling and the bes weighing. The newly devised Wisconsin high p is described, and full directions given for its use. enables the operator to determine accurately the of butter, thereby rendering his product more u such control.

BULLETIN 155. THE DISTRIBUTION OF STALLIONS SIN.—This bulletin includes a summary of the prog done by the Department of Horse Breeding since t of the stallion law in 1905. The strong and weak law are pointed out and the needs of new legislatio Questions concerning the renewal of licenses, numb acter of same are given, together with a discussion tion of soundness to the law. The full text of t stallion law with amendments and additions is well as a brief statement of stallion legislation in The number and breed of stallions is given by cou directory of owners of stallions licensed in 1906 from Bulletin 141.

BULLETIN 156. A SIMPLE TEST FOR CASEIN IN RELATION TO THE DAIRY INDUSTRY.—This bulletin, the new simple casein test, gives full directions c manipulation, and discusses its relation to the dai The test involves the use of a special tube, so design mit of the reading of the percentage of casein d it has been precipitated by dilute acetic acid and moved with chloroform. A special centrifuge is the casein into one part of the tube for reading. also gives a discussion of the accuracy of the tes tions influencing it, as well as some precautions to The method can be followed by an unskilled operat sonable accuracy when proper care is exercised. T is not only of value to the factory operator, but places in the hands of breeders an instrument which may result in the selection and development of high casein producing animals.

BULLETIN 157. LICENSED COMMERCIAL FEEDING STUFFS, 1907.—This bulletin presents a list of manufacturers' names with licensed brands and the guarantees of protein and fat of each brand as given by the manufacturers as required by law. An analysis of various brands is also presented, as well as the aw relating to the control of feeding stuffs.

BULLETIN 158. THE GRADE STALLION SITUATION IN WISCONSIN.——The beneficial effects of the licensing of public service tallions are fully outlined in this popular discussion of the ubject. The prevalence of the grade stallion, predominance of certain breeds, and some notes upon poor practices among farmers are given. The stallion situation of other states and abroad s noted, and improvements in the system of offering premiums for stallions at county fairs are suggested. The bulletin furnishes an excellent popular discussion of the situation disclosed by the license operations of the Department of Horse Breeding.

BULLETIN 159. THE CRANBERRY INSECTS OF WISCONSIN.—This bulletin contains a summary of studies of the problems of insect control on cranberries for two seasons in Wisconsin. The peculiar soil and vegetation conditions of this state make special investigations necessary, and Wisconsin cranberry growers cannot rely upon results of work done in other states along this line. Detailed descriptions of the cranberry insects, together with colored plates, make this bulletin especially valuable for those desiring to become familiar with enemies of the cranberry in Wisconsin.

BULLETIN 160. TESTS OF DAIRY COWS, 1906–1907.—A summary of tests conducted and cows tested is presented with all of the test records and illustrations of some of the best producers. Special attention is given to the record of Colantha 4th's Johanna, the champion Wisconsin cow, and the test conducted on her.

BULLETIN 161. GRAINS AND FORAGE CROPS FOR NORTHERN WISCONSIN.—This bulletin contains discussions and recommendations based upon results with crops grown during the past two years at the Northern Sub-station farms, together with notes on other crops suited to the northern part of the state. Trials with barley, corn, oats, field peas, wheat, alfalfa, soy

beans, and root crops are outlined. Notes on va
best results are of special value.

BULLETIN 162. RUSTY CANS AND THEIR EFFECT
FOR CHEESEMAKING.—This bulletin outlines experi
influence or rusty utensils on rennet action in mil
the effects of handling milk for cheesemaking in
Attention is called to the methods followed in Eu
countries as compared with conditions in this co
gards the type and construction of milk vessels. T
better grade of utensils and better care of the
emphasized.

BULLETIN 163. LICENSED COMMERCIAL FERTIL
LIST OF LICENSED FEEDING STUFFS, 1908.—This bu
lished in accordance with the requirements of t
on commercial fertilizers and feeding stuffs, and gi
analyses of samples. Some suggestions as to the
use of commercial fertilizers and the valuation of
included to aid the farmer. The names of firms w
istered feeds for license in this state, together w
brands, are given.

EXTENSION SERVICE.

The function of the modern agricultural colleg
nently that of an instrument of the state to aid i
ways in the development of the commonwealth.
of such an institution lies in its close touch with
and whenever it loses the stimulus that comes fr
tionship, its value will begin to lessen. A consta
ing amount of aid has been afforded the agricultu
for years by carrying the results of scientific stu
to the farmer. This work is appreciated in a wa
the obligation of its continuance and developme
and the time is now ripe for the organization of
activities into more definite and correlated lines.

Naturally this extension work may take concrete
way of college or station extension, but it is ver
separate these two lines, as the work is essentially
farmer how to apply directly to his problems the res
in experimental inquiry.

During this last year special effort has been mad state-at-large by holding farmers' courses of several days' duration, similar to the ten day Farmer's course, which has been in progress at the University for the last five years. The course at Madison continues to grow in influence. Last year over 700 farmers, from 50 counties and 4 outside states, participated in this work. More and more it is attracting the most progressive men of the state, and its influence is probably greater than any other line of our work for the time, energy, and expense involved. We find that this brief course is a prominent feeder of our regular courses of study, as the farmer thereby becomes convinced of the desirability of an agricultural course for his boys.

In addition to this course, two courses were held in cooperation with the County Agricultural Schools at Winneconne and Marinette. A staff of a half dozen or more teachers from the Agricultural College gave a series of lectures, demonstrations, and judging work that was most enthusiastically received. From 400 to 600 persons, from 9 different counties, were in attendance at Winneconne. This work in a way may be regarded as partially equivalent to the Farmers' Course at Madison in bringing the University into direct relation with many people who are unable to attend the regular winter course at Madison. The coming year this series of meetings will be extended so as to include all of the County Agricultural Schools that are now organized. This extension work, is planned in connection with the Farmers' Institutes, so that a wider field is covered than was formerly possible.

LECTURES, CORRESPONDENCE, ETC.—Members of the College staff have held meetings or assisted in such work by giving lectures in over 80 cases during the last year. The demand for such aid is many times our ability to supply.

A continually increasing amount of correspondence relating to what is substantially extension work is carried on each year. An approximate estimate for the past year indicates the transmission of about 30,000 letters, besides the mailing of 360,000 bulletins and reports.

DEMONSTRATION WORK.

While much good can doubtless be done by extension lectures, separately or in a series, the nature of the problems attacked is often such that an actual demonstration is the most effective

way to the present the subject. The eye is the c
to the brain, and actual demonstration of a proce
convince where all other means fail. Past experienc
the value of this demonstration work. The followi
gives a digest of the more important lines in pro
the past year.

POTATO SPRAYING.—The losses from potato blight
from year to year (10 to 70 per cent actuall
but have been severe for three years out of the last
application of Bordeaux mixture would reduce t
half, and for the last four seasons the Horticultura
has carried on demonstration spraying work on
seven counties in the potato belt (Waupaca, Wau
Columbia, Portage, Sauk, and Burnett). Field m
at the time of application of the spray, and agai
time, gave opportunity to demonstrate the manner c
ing the mixture, as well as the results obtained.
furnishes the machines (loaned to us by the ma
the spraying materials, and supervises the work.
furnishes the necessary labor for compounding a
the mixture, and takes care of the crop. From 30
els increase per acre has been obtained, and it is
that practically the only portions of the state wher
spraying is practiced are those in the vicinity of
stration fields.

The potato industry of this state is susceptible
pansion on the sandy loams of central and north
consin, and it is of utmost importance to induce th
spray. This demonstration work should also be c
recommendations as to improved methods of cultu
selection.

ORCHARD SPRAYING.—This year demonstration w
tended to orchard fruits. Three orchards in Sau
and Winnebago counties, have been sprayed wit
mixture for apple scab, and arsenate of lead and
for codling moth and leaf-eating insects. This wo
supervised by Mr. Milward, the field expert on
most of the orchard spraying requires treatment
spring to mid-summer, while the potato work run
to October. The results of the work will soon be

TRIAL ORCHARDS.—In connection with the work of the northern sub-stations, trial orchards have been established at Superior, on the Bayfield Peninsula, and on Madeline Island, in Lake Superior. From indications it appears that this section of the state has many advantages as a fruit growing region.

TUBERCULOSIS POST-MORTEM DEMONSTRATIONS. — The campaign against bovine tuberculosis has been aggressively pushed this year by continuing the method of holding public demonstrations (in cooperation with the State Live Stock Sanitary Board), where reacting cattle are killed and the nature of this cattle scourge demonstrated to stock owners. The widespread interest thus developed has resulted in wholesale testing, and in some counties from 20 to 50 per cent of all dairy stock has now been examined.

Prior to the inauguration of this work, the Station was securing less than a thousand tests per year. This active demonstration campaign was begun in 1906, and the number of Station-controlled tests in that year increased to 5,000; in 1907 to 11,000, and last winter to nearly 30,000. The correspondence work connected with this has required the entire time of Mr. Hoffmann and two stenographers during the testing season. The reduction in tuberculosis noted is very marked, and the state is now actively reaping the benefits of its precautionary efforts, in that its reputation for healthy breeding and dairy stock is the best in the Union.

During the summer of 1908 a tuberculosis conference was held at Madison, attended by representatives of the live stock and veterinary interests of the upper Mississippi Valley states, at which consideration was given the securing of uniform methods of inspection and control.

NORTHERN SUB-STATIONS.—At three points in northern Wisconsin, Ashland, Superior, and Iron River, sub-stations have been established for several years, the object of which was to work out on the peculiar types of soil characteristic of the region, the best type of agriculture. At Ashland and Superior, this work is being done on the heavy red clays; at Iron River on the light sandy soil. These stations partake of the nature of demonstration farms, although much experimental work of value has been carried out on them. The work has been handled jointly by the departments of Soils, Agronomy, and Horticulture, and has been under the immediate management of Supt.

E. J. Delwiche. The results already attained are
satisfactory. Although in operation for only three
have profoundly affected the agricultural developı
region. Over 200 farmers have been assisted in
cooperative tests with seed grains and forage plaı

The problems here under consideration are pec
cult on the heavy red clays, as this type of soil is on
most people are unfamiliar, therefore the experimeı
tile drainage, to remove the excess water, has been v
especial interest.

The work in horticulture is also especially proı
seems quite likely that the Apostle Islands and
Peninsula, are well adapted for the raising of orc
Small fruits of all kinds can be grown very suc
these northern counties, and the exceptionally favor
that obtain at the head of the lakes, make this a ve
line of agricultural development.

As indicating the appreciation with which the w
northern sub-stations is held by the people in thes
append an extract from a letter received recently fı
inent business man of Ashland.

"I feel that your department of the University
ticular the experimental station deserves praise foı
this station in this part of the state where it has lo
gently needed." * * *

"Many people who come up here to start home
selves are from the overcrowded cities and to this
tlers especially the experimental farm here has p
of untold value. * * * We who are connected
velopment of this part of the state appreciate ver
work that has been done on this experiment farm
ence is wide-spread and by maintaining the work an
it in every way money would be wisely invested by

GENERAL EXTENSION WORK.

DISSEMINATION OF PURE-BRED SEEDS.—The prop
dissemination of pure-bred seed grains have been
continued by the Agronomy Department. Members
periment Association have aided greatly in this
Professor Moore estimates this year that one-fourth
now grown in the state is of the Swedish Select typ

of the barley is of the Oderbrucker or Manshury varieties, and about one-third of the corn now grown is from pure-bred seed. Over a thousand corn centers have been established this year where growers are propagating selected seed secured from the Station. This work has been pushed not only with reference to corn, but also with the smaller grains, and it is confidently expected within a comparatively short time that selected pure-bred varieties will take the place of the mixtures of varieties that are now used for seed purposes. In the matter of barley alone, this is a matter of the greatest import, as the value of the crop for certain special purposes, such as brewing, depends in a large measure upon its uniformity, and brewers are glad to pay a considerable advance over the market price of the grain to secure a type that is absolutely uniform in germinating quality.

SELECTION OF TOBACCO SEED.—For the last four years special effort has been given to the improvement of tobacco by seed selection. When this work was begun, there was found to be the greatest diversity in the character of the tobacco grown in the state. Each farmer raised his own seed by leaving a few stalks in the field to ripen. Starting with the best types that could be secured (Connecticut-Havana), Professor Sandsten has grown these under special conditions in different portions of the state for the last three years. Only typical plants have been allowed to mature, and in this period over 2,000 growers have received this improved seed, which is superior in quality, yields well, and the value of which is attested by the fact that at the meeting of the State Tobacco Growers' Association, this improved stock took the sweepstakes, first and second prizes. Professor Sandsten estimates at the present time that two-thirds of the Wisconsin crop is now produced from this selected seed.

YOUNG PEOPLES' CORN GROWING CONTESTS.—For the last few years Professor Moore has carried on a new type of extension work in connection with several of the county fair associations. Through the Secretaries of such associations, selected types of corn have been distributed free to young people, and full directions given to them as to method of handling and harvesting the crop. Exhibits were then made at the county fairs in the fall, and through the stimulus of special premiums given by the fair authorities, as well as by the general public, interest of the young people was aroused and maintained. During this last year the work has been extended, and fairs have cooperated in this dissemination work on At the Dane County fair this fall, over 800 corn exh by the young people of the county, were on display number of exhibits of corn was made in this single y the previous history of the Association. At the Chi fair, approximately 600 exhibits were also secured.

This work has greatly stimulated the interest of y in farm matters, and offers a sane way to attack the interesting the youth in agricultural education. I of counties school superintendents have aided gre work, thus bringing the rural schools in direct re this extension work of the University.

COOPERATIVE LIVE STOCK BREEDING ASSOCIATION important move in securing an improved quality o is to induce the farmers to purchase pure-bred sir effort has been directed by Professors Humphrey, and Fuller, toward the organization of cooperati organizations, by aiding the farmers of a communi along some special line of breeding. The success been attained by such community effort is most str ferson County last year sold $600,000 worth of Lake Mills is now the leading Holstein center o $175,000 worth of stock having been sold last season of the world, much of it going to Mexico, Japan, America. The matter of organizing these associatio pushed, with the result that sixteen have been for breeding of dairy cattle, one for draft horses, and on the most of them within the last two or three years. is rapidly making Wisconsin the leading breedin dairy cattle.

DAIRY COW TESTS.—The extension work in testing milk production of pure-bred dairy stock continues year by year, under Professor Woll's direction, th total number of tests conducted of all kinds and b 1,290 on 421 cows. At present 12 supervisors ar under Civil Service rules, the breeders whose cow paying the expenses connected with the same. Th nomenal record noted is that of the banner milk-pro Colantha 4th's Johanna, owned by W. J. Gillett o which produced in one year nearly 27,500 pounds approximately 18 times her own weight. This is the highest authenticated record of any dairy animal, and her official test created world wide attention when published.

There is much need that the farmers interested in general dairying take up the work of testing their cows to ascertain whether or not they are profitable. This work can be better accomplished by the organization of cow testing associations. As this line of extension effort is being pushed at the present time by the Wisconsin Dairymen's Association, there is not the necessity for the College developing the same, but the need of such work is yet very great throughout many portions of the state.

BUTTER AND CHEESE SCORING EXHIBITIONS.—These are designed to help the factory operator by scoring his product and advising him how to improve the quality of the same. The work is yet new, this being the first full year, but 1,400 samples of butter, from 254 exhibitors, and 778 samples of cheese, from 195 makers, have been examined by a board of judges and reported upon by Mr. Michels. Of these, 150 exhibitors have sent in monthly samples at least six or more times. It is noteworthy that the scores of those who are continual exhibitors in this work are materially higher than the average, and the participants in the scoring exhibitions were the prize winners at the State Fair in 1907 and 1908, and at the dairy conventions, both state and national.

It would be highly desirable if it were possible for us to send a field instructor to the various factories to aid the maker when troubles of a more or less serious character are discovered. A special attempt in these exhibitions should be made to reach the maker whose product is not first class, and, as is usual where scoring is carried on, the emphasis falls on the man who makes the best record.

DRAINAGE SERVICE.—The demand for aid in formulating plans for the reclamation of wet lands by tile drainage is rapidly developing. The Soils Department aided last year about 150 land owners by correspondence, 35 individual owners, and 17 drainage districts. A considerable part of Mr. Jones' time was employed in examining locations and making plans for installation of tile drainage.

SOIL EXAMINATIONS.—There is also much call for help in the matter of soil management, particularly as to special types, as the marshy, sandy, and heavy clay soils. Special aid has been

given by the Soils Department in about 400 case
two years. Seven cooperative fertilizer experime
soil, with potash and phosphorus, were under
this past season. Extension work along these lin
quire the entire time of a soil expert, if we were i
furnish the same.

SOIL SURVEY.—As these calls for help in the m
management increase, it becomes more and more
there must be made as soon as possible a suitable
The Geological and Natural History Survey have
work in this connection, but the work naturally
directed with especial reference to agricultural con
ognizing the desirability of cooperating with this
the Soils Department has this year carried out
inary work on such a survey in Pierce, Eau Clair
and Rusk counties. Great interest has been mani
work by the farmers in these regions, and the metho
will indicate the course to follow in further study.
that arrangements may be made at the coming me
legislature to provide for the establishment of su

INSPECTION AND CONTROL WORK.

In several departments of the state's activities, t
inspection work required by law is placed under
of the Experiment Station, rather than under spe
boards. Inasmuch as this is for the protection of
and thus for the state-at-large, it is here grouped i
with the extension service, rather than under the
search work. It is highly important that this ins
be aggressively prosecuted, as it is only in this
consuming public can be thoroughly protected a
and deception.

STALLION LICENSING.—The attempt to improve
dustry of the state by licensing stallions has b
with much success. The first census, taken in 1905,
fact that of the 3,000 animals used for service, 60
of grade or "scrub" origin. The law has only be
tion three years, but a noticeable diminution in gra
observed. Dr. Alexander, under whose direction t
been developed, reports that over 550 animals h

tired from service, of which nearly 100 were castrated, or licenses revoked for unsoundness. Several flagrant violations of the law have been found. Fraudulent registry papers have been disclosed, and cases determined where purchasers have been actually defrauded by falsification of records.

This important work of improving the horse industry needs further development, as it is a peculiar fact that less attention is paid to the mating of horses than cattle. The good example set by Wisconsin in the matter of licensing stallions was quickly appreciated by other states, as similar laws have since been enacted in five other states.

The following financial statement gives the receipts and disbursements of the Department of Horse Breeding for the year June 30, 1907 to June 30, 1908, inclusive.

To Fees, original license certificates	$1,117 47	
renewals	1,782 30	
transfers	119 15	
duplicates	75 00	
By Salaries		$2,164 24
Office and traveling expenses		527 10
Balance		402 58
	$3,093 92	$3,093 92

FEED AND FERTILIZER INSPECTION.—The work in this department under the direction of Professor Woll has increased very much during the last year, due to the amendment of the state feeding stuffs law, whereby all mill feeds are made subject to a manufacturer's annual license. Some 840 feed stores in 217 different towns have been licensed, and 411 samples of feeding stuffs collected and analyzed during the year.

The new feeding stuffs law has been enforced this year under protest of the millers, and a suit has been brought to test its constitutionality in the courts. The law was sustained in the lower court, and is now before the Supreme Court.

The necessity for a strict control in this work is recognized from the several important cases of adulteration and fraud that have been discovered this year. Cases of gross contamination of mill feeds with foul weed seeds and mill sweepings, and of cotton-seed hulls in molasses feed, have been discovered. The beneficial effect of state control is noted, however, in the greatly improved character of feeds now sold in the state, as compared with those which were previously handled.

A most flagrant violation of the fertilizer law was found in the case of one manufacturer who put powdered quicklime on

the market and sold it at the rate of $70 to $15
cording to size of package.

NURSERY INSPECTION.—Over a hundred nurse
inspected this year by the representatives of the
Department, under whose jurisdiction this work is
the San José scale has been found in nursery s
in a cemetery in Milwaukee, where infested tree
of the state were shipped in. For three years t
now been found in nursery stock, but so far it h
check. It is very desirable that the law be mo
control interstate shipments. As it now stands in
own nurseries is made, but no sort of adequate c
cised over shipments from outside the state.

SEED CONTROL.—The Agronomy and Hortic
ments for a number of years have made numerous
grains, and forage plants, as to purity, germina
importance of this work is coming to be recogn
more, as it becomes evident that the yield of gra
crops is so largely influenced by the character of
This last year over 500 samples of seeds were
Agronomy Department, and 75 by the Horticu
ment, among which a number were found to be
terated and contaminated with noxious weed se
introduction would have been a serious menac
matter of seed control should receive early attent
isfactory statute drawn which will put this matter
foundation, so that the farmer can be protected
weeds and adulterations that are now very freque

ACKNOWLEDGMENTS.

The following donations and loans have been received by the Agricultural xperiment Station during the past year.

DONATIONS.

armers' Phosphate Co., Urbana, Ill., four tons rock phosphate.

erman Kali Works, New York, N. Y., two tons sulphate of potash.

itrate of Soda Propaganda, New York, N. Y., 200 pounds of nitrate of soda.

irke. Davis & Co., Detroit, Mich., pure cultures of bacteria.

Reichel, Veterinary School, University of Pennsylvania, pure cultures of bacteria.

S. Biesecker, 99 Murray St., New York, N. Y. sanitary milk pail.

enberg Milk Products Co., Cortland, N. Y., five pounds of powdered milk.

ew York State College of Agriculture, Ithaca, N. Y., pure cultures of bacteria.

rp-Thomas Farmogerm Company, Bloomfield, N. J., samples of Farmogerm.

e Good Health Co., Battle Creek, Mich., Yogurt tablets.

ited States Sugar Company, Madison, Wis., eight pounds sugar beet seed from Seattle, fifteen pounds seed grown at Nordhausen, Germany.

rton Brothers, Acton Grange, Warrington, England, one-half bushel each of six varieties of oats. and one of barley, also eight pounds sample of barley and four ounce package of oats.

lzer Seed Co., La Crosse, Wis., one peck Regenerated Bonanza oats, one peck Black Egyptian oats, five pounds National oats, five pounds Emperor William oats, five pounds Great Northern oats, five pounds Black Prolific oats.

drew Finsnes, Chippewa Falls, Wis., forty ears Clark's Yellow dent corn.

illiam Nesbit, Richland Center. one peck Scotch oats.

ewellyn Fleek, Brodhead, three ears White dent corn.

. S. Marshall, Delton, three ears Salamander corn grown in Texas.

shua Strange, Marion, Ind., two corn racks.

A. Stannard, Emporia, Kan., one barrel of swine dip.

H. McMullan, Woodstock. Ohio, two Rambouillet wether lambs.

nk Bros., Sun Prairie, Wis., two Shropshire wether lambs.

H. Ried, Philadelphia, Pa., pasteurizer and cooler.

rke-Davis Laboratory, Detroit, Mich., culture for starter

ov Ericcson, St. Paul. Minn., culture for starter.

rs. Hansen Laboratory, Little Falls, N. Y., culture for starter.

C. Keith, Boston, Mass., culture for starter.

arschall Dairy Laboratory, Madison, Wis., two sets apparatus for determining acidity of whey.

Frank Smith, Pleasanton, Kan.. copy "Eby Handy Tables."

I. Case Thresher Co., Racine, Wis., 150 copies Traction Engine Manual.

e Laval Separator Co., Chicago, Ill., two sets tread wheels, two rubber bowl rings.

ells-Richardson Co., Burlington, Vt., one gallon butter color.

LOANS.

Creamery Package Manufacturing Co., Chicago, Ill., No. 2 Twentieth Century milk heater, Farrington pasteurizer, Farrington cream ripener, Boyd cream ripener, Victor starter can, 300 gallon Wizard cream ripener, two Wizard testers, 24 bottle turbine, two Victor foot powers, Ideal skim milk weigher, 12-bottle hand tester, two 24-bottle turbine testers, two Wisconsin curd tests. No. 1 Twentieth Century heater, American butter printer, Disbrow churn, Turbine tester, 24 bottle, Hand tester, 12 bottle, Hand tester, 8 bottle. Victor skim milk pasteurizer, 24-bottle tester for electric motor. Trunion starter can, moisture oven, casein tester, 6-bottle. Farrington Jr. moisture oven.

A. H. Barber Creamery Co., Chicago, Ill., No. 4 power cream separator, No. 6 Simplex churn, No. 2 B. & W. milk heater, No. 1 Simplex hand separator, B. & W. check pump.

D. H. Burrell Co., Little Falls, N. Y., 4-bottle hand tester, 36-bottle turbine tester, 6-bottle facile tester, 24-bottle hand tester, 24-bottle turbine tester, Simplex separator bowl, No. 4.

International Harvester Co., Madison, Wis., No. 2 A Cream Harvester separator, No. 4 Dairy Maid separator, 3 H. P. upright gasoline engine, Dairy Maid separator, Blue Bell separator.

Perfection Anti Dirt Pail Co., Albert Lea, Minn., milk pail.

Melchior Armstrong & Dessau, New York, N. Y., Perfect Gloria separator.

J. Cherry, Cedar Rapids, Iowa, Edwards Mother Culture case with bottle.

Exhaust Steam Purifier Co., Berlin, Wis., Purifier pump and tank.

Montgomery Ward & Co., Chicago, Ill., Golden Cream Harvester.

G. W. Kennedy, Thornton, Iowa, Kennedy aerator.

Marshfield Churn Co., Marshfield, Wis., hand churn.

Marschall Dairy Laboratory, Madison, Wis., two Marschall acid tests.

Milo D. Beach, Litchfield, Conn., Triumph test bottle shaker.

Fuller & Johnson Co., Madison, Wis., 3½ H. P. gasoline engine, 2½ H. P. gasoline engine.

National Separator Co., Goshen, Ind., one hand separator.

Burmeister & Wain. Copenhagen, Denmark, Perfect hand separator.

Smith Manufacturing Co., Chicago, Ill., Great Western cream separator.

Miller-Tyson Co., Canton, Ohio, milk heater.

Brillion Iron Works, Brillion, Wis., Junker curd mill.

Albrecht Manufacturing Co., Kewaunee, Wis., skim milk and whey pump.

Perfection Churn Co.. Owatonna, Minn., Size 4 power churn.

National Wrapping Machine Co., Los Angeles, Cal., butter wrapping machine.

Standard Separator Co., Milwaukee, Wis., two hand separators, Champion No. 4 and No. 6.

Sears, Roebuck & Co., Chicago, Economy cream separator.

Lever Cream Separator Co., Indianapolis, Ind.. hand separator.

Northern Electric Co., Madison, Wis., 5 H. P. motor.

King & Walker Co., Madison, Wis., high pressure moisture oven.

Standard Separator Co., Milwaukee, Wis., Champion No. 6 and No. 4 cream separators.

Currie Hardware Co., Mason City. Iowa, two Eclipse moisture ovens.

Gehl Mfg. Co., Milwaukee, Wis., butter printer.

International Construction Co., Chicago, Ill., 6-bottle filler.

Jansen Mfg. Co., Topeka, Kan., pasteurizer and cooler, Haughdabl starter can.

Vermont Farm Machine Co., Bellows Falls. Vt., 20-bottle turbine tester, No 2½ U. S. separator, 12-bottle hand tester, No. 7 cream separator, 24-bottle Agos tester, No. 6 hand separator, No. 8 hand separator.

De Laval Separator Co., Chicago. Ill., Acme cream separator. Nos. 17, 12 and 15 hant separators. Sectional hand separator.

McKinnon & Co., Sheboygan Falls Wis., Combination cheese press.

Empire Separator Co., Bloomfield. N. Y., Nos. 1 A and 2 B cream separators.

Sharples Separator Co., West Chester, Pa., 12-bottle Russian tester, Triumph test bottle shaker, No. 32 power separator with accelerator washer, Nos. 6 and 4 hand separators.

Acme Harvester Co., Poria, Ill., 6-ft. grain binder.

American Plow Co., Madison, Wis., 16-inch sulky plow, disc harrow and transport truck.

Alamo Mfg. Co., Hillsdale, Mich., 18 H. P. gasoline engine.

J. D. Adams Co., Indianapolis, Ind., Road King road grader.

Baker Mfg. Co., Evansville, Wis., 4-horse power vertical gasoline engine.

Aspinwall Mfg. Co., Jackson, Mich., potato planter and cutter.

Bateman Mfg. Co., Grenlock, N. J., potato planter.

Bradley Mfg. Co., Bradley, Ill., corn planter and exhibition platform.

Bruley Steel Fence Post Co., Milwaukee, Wis., six indestructible fence posts, two rods of woven wire.

F. H. Battles, Rochester, N. Y., two swinging cow stanchions.

J. I. Case Plow Co., Racine, Wis., corn planter and exhibition platform, disc harrow.

Champion Potato Machinery Co., Hammond. Ind., potato planter and cutter.

W. B. Crumb, Forestville, Conn., two swinging cow stanchions.

J. R. Christensen, Oshkosh, Wis., brick silo model.

Dain Mfg. Co., Ottumwa, Ia., hay loader and mower.

Deere, Mansur, & Co., Moline, Ill., corn planter and exhibition platform and one exhibition corn planter shank.

John Deere Plow Co., Moline, Ill., Deere 16-inch sulky plow, Elk corn cultivator, and Deere corn cultivator.

Jos. Dick Agricultural Works, Canton, O., Blizzard silage cutter.

Emerson Mfg. Co., Rockford, Ill. No. 10 corn planter, 14-inch mold board gang plow, No. 5 standard mower.

Fuller and Johnson Mfg. Co., Madison, Wis., corn planter, gang plow, disc harrow, cultivator, 6 H. P. open jacket gasoline engine, walking plow, 5 tooth walking cultivator. transplanter.

Gilson Mfg. Co., Port Washington, Wis., 1 H. P. air cooled gasoline engine.

Hayes Pump and Planter Co., Galva, Ill., corn planter.

Hunt, Helm, Ferris Co., Harvard, Ill., swinging cow stanchions.

Johnson Field Mfg. Co., Racine. Wis., grain cleaning mill.

Independent Harvester Co., Plano, Ill., manure spreader.

International Harvester Co., Chicago, Ill., 12 H. P. portable gasoline engine, 3 H. P. vertical gasoline engine, 2 H. P. sectional gasoline engine, mounted exhibit. farm wagon and manure spreader, 3-roll corn shredder, 6-foot Deering grain binder, 6-foot Champion binder, 6-foot McCormick binder, one binder attachment and one four-row corn shredder, 6-foot Milwaukee grain binder, 6-foot Osborne grain binder.

Janesville Machine Co., Janesville, Wis., corn planter and exhibition platform.

J. I. Case Threshing Machine Co., Racine, Wis., 20 H. P. traction engine, 15 H. P. traction engine.

Advance Thresher Co., Battle Creek, Mich., 16 H. P. engine.

Gaar-Scott Co., Richmond, Ind., 16 H. P. engine.

Louden Machine Co., Fairfield, Ia., four swinging cow stanchions.

Minneapolis Silo Co., Minneapolis, Minn., section of stave silo.

Manson Campbell Co., Detroit, Mich., Chatham fanning mill and corn grader.

MacDonald Bros., Pleasant Hill, Mo., 4-ton wagon platform scale.

Mehring's Pneumatic Hand Power Milking Co., cow milker.

Meyers Bros., Ashland, O., pump exhibit, hay track carriers, and slings.

Northern Electric Mfg. Co., Madison, Wis., one 10 Kl. generator and one H. P. motor.

Newton Co., Batavia, Ill., Newton improved animal tie.

E. Prescott Boston, Mass., two swinging cow stanchions.

Robert Rom Co., Milwaukee, Wis., No. 5 economical hot air engine.

Reliance Iron and Engine Co., Racine, Wis., 4½ H. P. gasoline engine.

O. H. Robertson, Forrestville, Conn., two swinging cow stanchions.

D. M. Sechler Carriage Co., Moline, Ill., Black Hawk corn planter and exhibition platform. and one corn planter shank.
Stowell Mfg. Co., Milwaukee, Wis., No. 3 hay carrier and 15 feet of steel track.
Simplicity Tank Heater Co., Sparta, Wis., Simplicity tank heater.
Smith Mfg. Co., Chicago, Ill., manure spreader and 2 H. P. gasoline engine.
Temple Pump Co., Chicago, Ill., 5 H. P. double cylinder kerosene burning engine.
Van Brunt Mfg. Co.. Horicon, Wis., 17 disc 6 inch drill, shoe and bar, and sample feed gate.
Wizard Plow Co., Batavia, N. Y., bean harvester.
Wood Automatic Corn Planter Co., Milwaukee, Wis., automatic planter attachment.
F. & J. H. Welcher, Newark, N. J., two swinging cow stanchions.
Egan Mfg. Co., La Crosse, Wis., sprayer.
Ayers Bros.. Honey Creek, Wis., Brown Swiss cow.
Charles L. Hill, Rosendale, Wis., Guernsey bull
Gay Stock Farm, Holstein bulls.
J. Q. Emery & Son, Edgerton, Wis., Guernsey bull.
Renk Bros., Sun Prairie, Wis., Hampshire ram.
Arthur Broughton, Albany, Wis.. Clydesdale stallion.
Pabst Stock Farm, Oconomowoc, Wis., Percheron stallion.

EXCHANGES.

The following papers come to the Station in exchange for its reports and bulletins. While used by those connected with the Station to learn the expression of agricultural experience and sentiment, they are placed in the library where they can be read and referred to by our agricultural students, and others of the University, as well as visitors.

FOREIGN EXCHANGES.

A Lavoura, Rio de Janeiro, Brazil.
L'Agricoltura Alessandrina, Alessandria, Italy.
L'Agricoltura Moderna. Milan, Italy.
Agricultural Bulletin, Straits Settlement, Singapore, East Indies
Agricultural Gazette of New South Wales, Sidney, Australia.
Agricultural Journal of the Cape of Good Hope, Cape Town, South Africa.
Agricultural Journal of India, Calcutta.
Agricultural News, Bridgetown, Barbados, West Indies.
Boletim de Agricultura, Sao Paulo Brazil.
Boletim do Instituto Agronomico, Sao Paulo, Brasil.
Boletin del Ministerio de Agricultura, Buenos Aires, Argentina.
Bulletin de l'Agriculture, Brussels, Belgium.
Bulletin des Séances de la Société Nationale d'Agriculture de France Paris.
Bulletin of the College of Agriculture, Imperial University, Tokyo, Japan.
Bulletin of the Department of Agriculture, Kingston, Jamaica.
Chronique Agricole du Canton du Vaud. Lausanne, Switzerland.
Cold Storage and Ice Trades Review, London, Eng.
Extrait des Travaux de la Société Centrale d'Agriculture du Department de la Seine inferieure, Paris.
Farmer's Advocate, London, Ontario.
Farmer's Advocate, Winnipeg, Manitoba.
The Field, London, England.
Garden and Field, Adelaide, South Australia.
Irish Farming World, Dublin. Ireland.
Journal für Landwirtschaft, Berlin, Germany.
Journal of the Bath and West of England Society, Bath, England.
Journal of the Board of Agriculture, London, England.
Journal of the British Dairy Farmers' Association, London, England.

Journal of the Department of Agriculture of South Australia, Adelaide, Australia.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Journal of the Department of Agriculture of West Australia, Perth, Australia.
Journal of the Royal Agricultural Society, London, England.
Journal of the Royal Horticultural Society, London, England.
Journal of the Sapporo Agricultural College, Sapporo, Japan.
Kgl. Landtbruks-Akademiens Handlingar och Tidskrift, Stockholm, Sweden.
Landwirtschaftliches Wochenblatt f. Schleswig-Holstein, Kiel, Germany.
Live Stock Journal, London, England.
Milch Zeitung, Leipzig, Germany.
Mitteilungen der Deutschen Landwirtschafts-Gesellschaft, Berlin, Germany.
Natal Agricultural Journal, Maritzburg, Natal.
New Zealand Dairyman, Wellington, N. Z.
North British Agriculturist, Edinburgh, Scotland.
Nor'-West Farmer, Winnipeg, Manitoba.
O. A. C. Review, Guelph, Ontario.
O Criador Paulista, Sao Paulo, Brasil.
Queensland Agricultural Journal, Brisbane, Australia.
Revista Agricola, Sao Paulo, Brazil.
Rural World, London, England.
Tidsskrift for det Norske Landbrug, Christiania, Norway.
Tidsskrift for Landökonomi, Copenhagen, Denmark.
Transactions of the Highland and Agricultural Society of Scotland, Edinburg, Scotland.
Ugeskrift for Landmand, Copenhagen, Denmark.
Weekly Times, Melbourne, Australia.
West Indian Bulletin, Bridgetown, Barbados, West Indies.

DOMESTIC EXCHANGES.

Agricultural Experiments, Minneapolis, Minn.
Agricultural Student, Columbus, Ohio.
American Agriculturist, New York, N. Y.
American Cheesemaker, Grand Rapids, Mich.
American Cultivator, Boston, Mass.
American Farm World, Augusta, Me.
American Fertilizer, Philadelphia, Pa.
American Food Journal, Chicago, Ill.
American Fruit and Nut Journal, Petersburg, Va.
American Miller, Chicago, Ill.
American Poultry Advocate, Syracuse, N. Y.
American Sheep Breeder, Chicago, Ill.
American Sugar Industry and Beet Sugar Gazette, Chicago, Ill.
American Swineherd, Chicago, Ill.
American Thresherman, Madison, Wis.
Arboriculture, Connersville, Ind.
Arkansas Homestead, Little Rock.
Baker's Helper, Chicago, Ill.
Better Fruit, Hood River, Ore.
Breeder's Gazette, Chicago, Ill.
Bulletin of the National Association of Wool Manufacturers, Boston, Mass.
Chicago Daily Drovers' Journal, Chicago, Ill.
Chicago Dairy Produce, Chicago, Ill.
Chicago Live Stock World, Chicago, Ill.
Cold Storage, New York, N. Y.
Colman's Rural World, St. Louis, Mo.
Commercial Poultry, Chicago, Ill.
Cornell Countryman, Ithaca, N. Y.
Cotton Seed, Atlanta, Ga.
Creamery Journal, Waterloo, Iowa.
Dairy Record, St. Paul, Minn.
Dog Fancier, Battle Creek, Mich.
Elgin Dairy Report, Elgin, Ill.
Equity Farm Journal, Chicago, Ill.
Fancy Fruit, North Yakima, Wash.
Farm and Fireside, Chicago, Ill.
Farm and Stock, St. Joseph, Mo.
Farm Implement News, Chicago, Ill.
Farm Journal, Philadelphia, Pa.
Farm Life, Chicago, Ill.
Farm Machinery, St. Louis, Mo.
Farm, Stock and Home, Minneapolis, Minn.
Farmer, St. Paul, Minn.
Farmer and Breeder, Sioux City, Iowa.
Farmers' Guide, Huntington, Ind.
Farmers' Review, Chicago, Ill.
Farmers' Tribune, Sioux City, Iowa.
Farmers' Voice, Chicago, Ill.
Field and Farm, Denver, Colo.
Flour and Feed, Milwaukee, Wis.

Fruit Grower, St. Joseph, Mo.
Gas Power, St. Joe. Mich.
Gas Review, Madison, Wis.
Geflügel Züchter, Wausau, Wis.
Gleanings in Bee Culture, Medina, O.
Guernsey Herd Register and Breeders' Journal, Peterboro, N. H.
Hoard's Dairyman, Fort Atkinson, Wis.
Holstein-Friesian Register, Brattleboro Vt.
Holstein-Friesian World, Ithaca, N. Y.
Homestead, Des Moines, Iowa.
Horse-Shoers' Journal, Detroit, Mich.
Horticulture, Boston, Mass.
Hospodar, Omaha, Neb.
Hospordårske Listy, Chicago Ill.
Illuminated World Life, Minneapolis, Minn.
Independent Farmer and Western Swine Breeder, Lincoln, Neb.
Indian School Journal, Chilocco, Okla.
Indiana Farmer, Indianapolis, Ind.
Industrious Hen, Knoxville, Tenn.
Iowa State Register and Farmer, Des Moines. Iowa.
Irrigation Age, Chicago, Ill.
Jersey Bulletin, Indianapolis, Ind.
Kansas Farmer, Topeka, Kan.
Kimball's Dairy Farmer, Waterloo, Iowa.
Lincoln Free Press, Lincoln, Neb.
Live Stock Journal, Chicago, Ill.
Louisiana Planter. New Orleans, La.
Metropolitan and Rural Home, New York, N. Y.
Michigan Farmer, Detroit, Mich.
Minnesota and Dakota Farmer Brookings, S. Dak.
Minnesota Farm Review, St. Anthony Park, Minn.
Minnesota Horticulturist, Minneapolis, Minn.
Missouri Agricultural College Farmer, Columbia.
National Farmer, Winona. Minn.
National Farmer and Stock Grower, St. Louis, Mo.
National Monthly Farm Press, Chicago, Ill.
Nebraska Farmer, Omaha, Neb.
New York Produce Review and American Creamery, New York, N. Y.
North Dakota Magazine, Bismarck, N. Dak.
Northwest Horticulturist, Tacoma Wash.
Northwestern Agriculturist, Minneapolis, Minn.
Nut Grower, Poulan, Ga.
Ohio Farmer, Cleveland, Ohio.
Oklahoma Agriculturist, El Reno, Okla.
Orange Judd Farmer, Chicago, Ill.
Oregon Agriculturist, Portland Ore.
Our Horticultural Visitor, Kimmundy, Ill.
Pacific Dairy Review, San Francisco, Cal.
Pacific Fruit World, Los Angeles, Cal.
Pacific Rural Press, San Francisco, Cal.
Poultry, Peotone, Ill.
Poultry Husbandry, Waterville, N. Y.
Practical Farmer, Philadelphia, Penn.
Prairie Farmer, Chicago, Ill.
Profitable Poultry, Milton, Wis.
Pure Products, New York, N. Y.
Reliable Poultry Journal, Quincy, Ill.
Rocky Mountain Farming, Logan. Utah.
Shepherd's Criterion, Chicago, Ill.
Shepherd's Journal, Chicago, Ill.
Southern Fruit Grower, Chattanooga, Tenn.
Southern Planter, Richmond, Va.
Southwestern Farmer and Breeder, North Fort Worth, Texas.
Student Farmer, Madison. Wis.
Successful Farming, Des Moines, Iowa.
Successful Poultry Journal, Chicago, Ill.
Sugar Beet, Philadelphia, Pa.
Texas Farmer, Dallas, Tex.
Town and County Journal, San Francisco, Cal.
Trade, Baltimore. Md.
Thresherman's Review, St. Joe, Mich.
Twentieth Century Farmer, Omaha. Neb.
Wallace's Farmer, Des Moines, Iowa.
Wilson Bulletin, Oberlin, Ohio.
Wisconsin Agriculturist, Racine.
Wisconsin Equity News, Madison, Wis.
Wisconsin Farmer. Madison, Wis.
Wisconsin Sugar Beet, Menomonee Falls. Wis.

ANNUAL REPORT

OF THE

WISCONSIN

State Board of Agriculture

For the Year 1909

JOHN M. TRUE, Secretary.

MADISON, WIS.
DEMOCRAT PRINTING COMPANY, STATE PRINTER
1909

LETTER OF TRANSMITTAL.

To his Excellency, J. O. Davidson,

Governor of the State of Wisconsin.

Sir:—I am pleased to herewith submit to you, the annual report of the Wisconsin State Board of Agriculture for the year ending March 1st, 1909.

JOHN M. TRUE,

Secretary.

OFFICERS

OF THE

Wisconsin State Board of Agri

President—George McKerrow.
Vice President—George G. Cox.
Secretary—John M. True.
Treasurer—(Ex-officio) A. H. Dahl.

BOARD OF MANAGERS

President—George McKerrow.
Vice President—George G. Cox, Grant U. Fishe
Nelson, George Wylie.

MEMBERS WISCONSIN STATE BOARD OF AGRICUL

At Large—George Wylie, Morrisonville.
At Large—Grant U. Fisher, Janesville.
1st District—C. H. Everett, Racine.
2d District—O. F. Roessler, Jefferson.
3rd District—George G. Cox, Mineral Point.
4th District—Wm. McLaren, Milwaukee.
5th District—George McKerrow, Sussex.
6th District—Chas. L. Hill, Rosendale.
7th District—J. L. Herbst, Sparta.
8th District—James J. Nelson, Amherst.
9th Dstrict—David Wedgwood, Little Suamico.
10th District—Ed. Nordman, Polar.
11th District—Laurens E. Scott, Stanley.

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Wisconsin Farm Crop Reports, 1908 489

List of Crop Reporters, 1908 496

Statistical Reports, 1907-1908 500

The Soil and its preparation for the Crop, Thomas Convey, Ridgeway 306

Corn—The Seed; Selection and Care, Prof. R. A. Moore, Madison 372

Planting and Cultivation, Geo. C. Hill, Rosendale 382

Harvesting and Securing the Crop, W. F. Stiles, Lake Mills 389

The Work of the State Live Stock Sanitary Board, Dr. M. P. Ravenel, Madison, Wis 407

Practical Swine Production, John L. Tormey, Madison 421

The Sheep Industry in Wisconsin, W. A. McKerrow, Pewaukee, Wis. 433

The Farmer's Horse, Hon. W. L. Houser, Mondovi 445

Conservative Farming, Col. W. A. Harris, Lawrence, Kan 456

Transmission of Dairy Qualities by the Sire, C. H. Eckles, Professor Dairy Husbandry, University of Missouri 468

Address, Prof. H. C. Wing, Cornell University, N. Y. 479

LAWS

RELATING TO THE

Wisconsin State Board of Agriculture

Wisconsin Statutes of 1898, Chapter 60.

Section 1456. The Department of Agriculture as heretofore established, is continued. Its object shall be the promotion of the interests of agriculture, dairying, horticulture, manufactures and domestic arts.

Said department shall be managed by a board, to consist of one member from each congressional district, and two from the state at large to be appointed by the governor, for terms of three years from the first day of January in the year of their appointment.

Not more than two-thirds of the members of said board shall be at the time of making any appointment thereto, members of the same political party. Vacancies shall be filled by the governor for the unexpired portion of the term.

Section 1457. The members of said board shall serve without compensation, but shall be reimbursed out of any funds set apart for their use by the state, or otherwise received by them, the sums actually expended in the performance of their duties.

Section 1458. Said board shall hold its annual meeting on the first Tuesday in February, and at such meeting shall elect one of its members as president, and one as vice president, and some person, not a member, as secretary, who shall hold his office for one year unless he is sooner removed by the board.

The state treasurer shall be ex-officio treasurer of the board.

Such officers shall perform such duties as usually pertain to such offices, and such as the board may direct.

Section 1458a. Said board may occupy such rooms in the capitol as may be assigned for that purpose by the governor.

They shall have sole control of the affairs of the Department of Agriculture, and all state fairs, and state fair grounds, and may make such by-laws, rules and regulations in relation to the management of the business of such department, and said fairs, and the offering of premiums thereat, as they shall from time to time determine.

The board shall make a report of its action to the governor, on or before the first day of December in each year.

Section 1458b. Whatever money shall be appropriated or otherwise received by said board, for the Department of Agriculture, shall be paid to the state treasurer, and be disbursed by him, on orders signed by the president and secretary of the board, for such purposes as, in the judgment of the board, will best promote the interests committed to their charge.

No officer, clerk or employee of said board shall have any claim upon the state for any salary or expenses, except such as may be allowed by the board, and paid from any appropriation or funds under their control and the state shall not in any manner whatever be liable for any debt or obligation incurred, or contract made by said board.

Section 1466. The principal officers of the state board of agriculture, ..., shall have full jurisdiction and control of the grounds, on which such board may exhibit, and all the streets, alleys and other grounds adjacent to the same, during all such exhibitions, so far as may be necessary to exclude therefrom all other exhibitions, booths, stands, or other temporary places for the retail or sale of any kind of spirituous or fermented liquors, or other articles, that they might deem objectionable.

The president, or in his absence, any vice-president acting in his stead, may appoint any necessary policeman to assist in preserving the peace, and enforce regulations upon the grounds and adjacent streets, who, for such purpose, shall have all powers of a constable and be entitled to similar fees.

Chapter 446, Laws of 1905.

Section 1. Section 1463 of the statutes of 1898, as amended by chapter 274 of the laws of 1901, is hereby amended so as to read as follows: Section 1463. There shall be paid within ten days after the first day of February, out of the state treasury, to each organized agricultural society, association, or board in the state, which shall have substantially complied with the following conditions, forty percentum of the total amount of premiums thereby paid at its annual fair for the preceding year, provided that in computing the amount upon which such percentum is to be paid, not more than one-half thereof shall have been paid for trials or exhibitions of speed or other contest, for which published premiums have been offered. On or before the first day of February, in each year, the president and secretary of each society, association, or board, claiming state aid, shall file with the secretary of state a sworn statement of the actual amount of cash premiums and purses paid at the fair of the preceding season, which premiums and purses must correspond with the published officers of premiums and purses, and a further statement that at such fair, all gambling devices whatsoever, and the sale of intoxicating liquors had been prohibited and excluded from the fair grounds, and all adjacent grounds under their authority or control. Such statement shall be accompanied by an itemized list of all premiums and purses paid, upon which such forty percentum payment is claimed, a copy of published premium list and speed list of fair, and a full statement of receipts and disbursements for the past year, duly verified by the secretary. Copies of such statements shall be deposited with the secretary of state and the secretary of the state board of agriculture. Such money shall be paid to the treasurer of the society, association, or board, upon his receipt, countersigned by the secretary. Provided, that the amounts to be paid to any such organized agricultural society, association or board, during any year, shall not exceed the following amounts to-wit:—to the State Board of Agriculture the sum of ten thousand dollars, to the Northern Wisconsin State Fair or the La Crosse Inter-State Fair Association, the sum of five thousand dollars each, and to any county agricultural society or other association or board above mentioned, the sum of one thousand and seven hundred dollars each.

Section 2. Sections 1458c of the statutes of 1898, 1458d of the statutes of 1898, as amended by chapter 356 of the laws of 1901, and chapter 337 of the laws of 1901, as amended by chapter 290 of the laws of 1903, are hereby repealed.

Section 3. Section 1464 of the statutes of 1898 is hereby amended so as to read as follows: Section 1464. All moneys received by any such society, association, or board, either from the state or any other source, after paying the necessary incidental expenses thereof, shall be paid out annually for premiums awarded, in such sums and in such way and manner as its by-laws, rules and regulations shall direct, on such live animals, articles of production, agricultural implements and tools, domestic manufactures, mechanical implements and productions as are the growth and manufacture of the district which such society, association or board represents, but live stock, the growth of any other county, state or country, may receive the same premiums as those which are the growth of the district where fair is located, should the society, association or board governing so decide.

Section 4. All acts or parts of acts in conflict with the provisions of this act are hereby repealed.

ANNUAL REPORT

OF THE

Wisconsin State Board of Agriculture

1909

MINUTES OF MEETINGS OF THE BOARD.

ANNUAL MEETING.

Madison, March 3, 1908.
10 O'Clock A. M.

Present—Messrs. Wylie, Fisher, Everett, Roessler, Cox, McKerrow, Hill, Herbst, Nelson, Wilcox, Nordman and Scott.

Absent—Mr. Watrous.

On motion of Mr. Fisher, proceeded to the election of officers. Chair appointed Messrs. Herbst and Nordman as tellers.

On motion of Mr. Wilcox, the rules were suspended, and the Secretary instructed to cast the vote of the Board for Geo. McKerrow for President for the coming year. The ballot was cast and Mr. McKerrow declared elected.

Balloted for Vice President, when James J Nelson received seven votes, and Geo. G. Cox five. Mr. Nelson was declared elected.

On motion of Mr. Fisher, under a suspension of the rules, the President cast the vote of the Board for John M. True for Secretary for the coming year, and he was declared elected.

Upon first ballot for member of Board of Managers, Mr. Wilcox received five votes; Mr. Roessler, three; Mr. Cox, three;

Mr. Wylie, one. On the third ballot, Mr. Cox received seven votes, and Mr. Wilcox, five. Mr. Cox was declared elected.

Upon first ballot for second member of Boord of Managers, Mr. Fisher received six votes; Mr. Roessler, three; Mr. Herbst, one; Mr. Wylie, one; Mr. Wilcox, one. On the fourth ballot, Mr. Fisher received seven votes; Mr. Roessler, four; Mr. Wilcox, one. Mr. Fisher declared elected.

Upon first ballot for third member of Board of Managers, Mr. Wylie received eight votes; Mr. Roessler, three, and Mr. Wylie was declared elected.

Superintendents of Departments were elected as follows: On motion of Mr. Wylie, F. L. Clemons was elected Superintendent of Gates, by acclamation.

On motion of Mr. Roessler, Grant U. Fisher was elected Superintendent of Grounds, by acclamation.

Upon ballot for Superintendent of Privileges, O. F. Roessler received eight votes; David Wedgwood, three and C. H. Everett, one, O. F. Roessler declared elected.

On motion of Mr. Cox, C. T. Fisher was elected Superintendent of Forage and Transportation, by acclamation.

On motion of Mr. Everett, C. G. Wilcox was elected Superintendent of Speed, by acclamation.

On motion of Mr. Roessler, R. B. Watrous was elected Superintendent of Promotion and Publicity, by acclamation.

On motion of Mr. Wilcox, George G. Cox was elected Superintendent of Grand Stand, by acclamation.

Upon ballot for Superintendent of Horse Department, George Wylie received nine votes; James J. Nelson three. George Wylie declared elected.

On motion of Mr. Cox, Chas. L. Hill was elected Superintendent of Cattle Department, by acclamation.

On motion of Mr. Roessler, Ed Nordman was elected Superintendent of Sheep Department, by acclamation.

On motion of Mr. Nordman, James Dillon was, by acclamation, made Superintendent of Swine Department.

Upon ballot for Superintendent of Poultry Department, Mrs. Adda F. Howie received nine votes; C. E. Matteson, two, and Mrs. Howie was declared elected.

On motion of Mr. Everett, J. L. Herbst was elected Superintendent of Agriculture and Horticulture, by acclamation.

On motion of Mr. Wilcox, C. H. Everett was elected Superintendent of Farm Exhibits, by viva voce vote.

On motion of Mr. Herbst, L. E. Scott was, by acclamation, elected Superintendent of Dairy Department.

On motion of Mr. Nordman, David Wedgwood was elected Superintendent of Machinery Department, by viva voce vote.

On motion of Mr. Roessler, James J. Nelson was elected Superintendent of Art Department, by acclamation.

On motion of Mr. Roessler, Mrs. Lida Thurston Gannon was, by acclamation, made Superintendent of Woman's Work Department.

On ballot taken for Marshal, Grant U. Fisher received seven votes; J. S. Donald, three; Mr. Gilman, two. Grant U. Fisher was declared elected.

On motion of Mr. Wylie, John A. Hazelwood was elected Superintendent of Educational Department, by viva voce vote.

On motion of Mr. Wylie, Mrs. Norah E. R. Perkins was, by acclamation, made matron of Woman's Rest Cottage.

Filling of the position of Official Physician was left to Board of Managers.

Dr. David Roberts was chosen Official Veterinarian, without compensation.

Mr. H. Raymond was chosen custodian of Grounds for six months, from April 1st, at $50 per month, he to be retained for balance of year if services are satisfactory to Board of Managers.

Mrs. B. L. Wentworth was re-elected clerk in Secretary's office at salary of $60 per month.

Voted, to have all grounds devoted to sale of Privileges platted, the Superintendent of Privileges to meet with Board of Managers in such work.

Mr. Wilcox introduced the following resolution:

"*Resolved,* by the Wisconsin State Board of Agriculture, in Annual Meeting assembled, That it is with deep regret that we learn of the illness of our former President, Mr. T. L. Newton, who is now confined to his home in Beaver Dam, and that the sympathy of this Board is hereby extended to him with the earnest hope and wish that he may soon recover his former health."

The resolution was unanimously adopted.

Voted to fix the salary of Secretary for the coming year at $2,200.

Recess taken until 1:30 P. M.

1:30 O'Clock P. M.

Quorum present.

The rules of Board were read and amended.

Mr. Wylie introduced the following resolution:

"*Resolved,* That no member of this Board shall have any interest, financially or otherwise, in any contract of any kind, or in any work done for this Board."

On a call for ayes and noes, ten members voted in the affirmative, and none in the negative. The resolution was ordered adopted.

On motion of Mr. Wylie the following resolutions were adopted:

"*Resolved,* That all watchmen upon Fair Grounds during the Fair, be under the direction of the Marshal, and receive their appointments from him.

"*Resolved,* That prices paid for help at Fair be fixed as follows: Superintendents, $5.00 per day; assistants, $3.50 per day; gatemen, police, and ticket-takers not to exceed 35 cents per hour, and no deviation from this rule shall be made except upon approval of the President, filed with the Secretary."

The following resolution was adopted:

"*Resolved,* That any Superintendent requiring supplies in his department shall file with the Secretary a requisition for such supplies, which shall be approved by the Board or Board of Managers, when the purchase shall be made by the Purchasing Agent of the Board."

Under the head of "Revision of Premium List," voted to increase premiums in Horse Department $2,255.00, in accordance with adopted schedule. The premiums in Cattle Department were in like manner increased $2,010.00. In Sheep Department $500.00, and in Swine Department $812.00.

Revision of premiums in Poultry Department was left to Superintendent and Secretary.

Voted, to allow increase of premiums in Art Department to extent of $150.00; in Bees and Honey $400.00, and in Horticulture $25.00.

Voted, to substitute "Farm Exhibits" for "County Exhibits'' premiums to be $100, $90, $80, $70. $60, $50, $40, $30, $20, $10.

The Secretary reported the following schedule of Speed Purses:

Pacing.

2:04 Pace	Purse $1,500
2:09 Pace	Purse $1,500
2:13 Pace	Purse $5,000
2:16 Pace	Purse $1,000
2:19 Pace	Purse $1,000
2:22 Pace	Purse $2,000
2:25 Pace	Purse $1,000
Colt Race	Purse $500

Trotting.

2:07 Trot	Purse $1,500
2:10 Trot	Purse $1,500
2:14 Trot	Purse $2,000
2:18 Trot	Purse $1,000
2:21 Trot	Purse $5,000
2:24 Trot	Purse $1,000
2:30 Trot	Purse $1,000
Colt Race	Purse $500

Total, $27,000,

which was adopted.

The following resolution was adopted:

''*Resolved,* That this Board hereby agrees to grant the privillege of construction of a sewer across a part of State Fair Grounds as shown by ''blue print'' filed with Secretary by the City of West Allis, if the Attorney General decides that this Board or its successors, have the right to connect with the same for the purpose of disposing of house or closet sewage from Grounds.''

Recess taken until 7:30 P. M.

7:30 O'Clock P. M.

Superintendent Scott was allowed to increase premiums in Dairy Department to $2,000.00, and it was voted to pro rate premiums in this department.

Appointment of judges was considered, and various parties endorsed for positions.

Mr. Roessler was made a committee from the Board to visit Milwaukee for the purpose of ascertaining if favorable arrangements can be made for "Labor Day" exercises at State Fair on Monday, September 7.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, March 27.

Meeting of Board of Managers.

All members present.

The Secretary read the opinion of Attorney General upon allowing the City of West Allis to construct a sewer across Fair Grounds. He also read the copy of a letter sent to officials of C. & N. W. Ry. relative to a vacation of the right of way on Fair Grounds, and the reply from the Railroad Company.

The Secretary was instructed to inform florists of proposed premiums for flower beds on Grounds, and to ask them to meet the Board at its next meeting.

Voted, to revise list of premiums for out-of-door flower beds and that premiums should be $50, $40, $30, $20, $10.

On motion of Mr. Cox, the Secretary was authorized to place a one-half page advertisement in Report of the American Society of Equity.

Superintendent Roessler presented the question of platting those parts of the Grounds to be given to concessions, and it was voted to allow no concessions to be sold South of the walk running West from entrance to Grand Stand to end of Woman's Work Building.

On motion of Mr. Cox, voted to give exclusive use of track to Milwaukee Automobile Club for races for the coming season.

On motion of Mr. Wylie, voted to have main Evening Show, during Fair, in Live Stock Judging Pavilion.

Miss Robinson, and Messrs. Barnes and McGrail came before the Board with offers of Vaudeville Acts for State Fair.

The Board contracted with Miss Robinson, representing the Western Vaudeville Association, for five Acts.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, April 9.

Meeting of Board of Managers.

All members present.

The Secretary was instructed to inform "The Modern Steel Structural Company" that certain parts of the Cattle Barn are defective, and ask it to, at once, make the same good.

A committee from Milwaukee Florists' Club was present in the interests of the offering of prizes for out-door flower beds, and announced the intention of the Club to interest itself in this exhibit.

Voted, to allow the substitution of "Batty Bears" for "Sammy Watson's Farm Yard Circus" in list of Special Vaudeville Acts to be secured from Miss Robinson, the change not to increase expense.

A communication from Milwaukee Hotelkeepers' Association relative to better system of keeping track of receipts at Team Gate was received, and suggestion adopted.

On motion of Mr. Fisher, voted to contract with F. M. Barnes for Liberati's Band—60 pieces and 18 vocalists—for five days of Fair, at $500 per day.

The Secretary was authorized to secure material for advertising and place same, also to place advertising with newspapers of the State.

Voted, to pay Ferry & Clas $150.00 in settlement of bill for suggestive plans of Cattle Barn last season.

Representatives of Gregory's and Pain's Fire Works Companies are to submit schedules of displays and prices to Secretary, within the next two days.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, April 23.

Meeting of Board of Managers.

All members present.

On motion of Mr. Fisher, Mr. Roessler, committee from Board of Agriculture on Labor Day Exercises, was authorized to offer Labor Unions of Milwaukee 25% of gross outside gate receipts on Monday, September 7th, or 50% of receipts from tickets authorized by them on that day, the Board to furnish a full line of attractions.

Messrs. Kopmeier, McLaren and Morawetz of Milwaukee Committee of Conference were present.

On motion of Mr. Wylie the Milwaukee Committee of Conference was asked to secure estimates of expense of arches for illuminated Court of Honor.

Voted, to put on exercises in front of Grand Stand Monday, Tuesday, Wednesday and Thursday evenings, in case Labor Day exercises are provided for Monday.

Mr. Wylie was instructed to secure terms upon which detachment of troops can be secured for evening exercises at Pavilion.

Closed with Allie Wooster for relay and chariot races at $2,000.

Messrs. Nelson and McLaren were asked to make out a satisfactory list of fire works and report at next meeting of Board.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, May 7.

Meeting of Board of Managers.

All members present.

Minutes of last meeting read and approved.

Mr. Klokner, representing Milwaukee Florists' Club, was present, and discussed the location of flower beds arranged for in premium list.

Mr. Klokner was engaged to superintend the location and laying out of flower beds, services not to exceed $16.00 in expenses.

On motion of Mr. Wylie, voted to appropriate $500 for display by Troop "A" at Pavilion Night Shows.

Mr. Nelson from Committee on Fire Works made report of progress.

Voted, to repair and macadam the street leading from Milwaukee Gate at Fair Grounds to Cottrell Ave.

The Secretary was instructed to correspond further relative to "Madam Marantette" as special attraction at Fair. The question of final employment was left to President and Secretary.

Voted, to offer reward of $50.00 for arrest and conviction of any party, or parties, doing damage to Fair Ground property.

Mr. Fisher was requested to ascertain terms upon which connection can be made with City Water mains, and supply of water obtained in case of emergency.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, May 20.

Meeting of State Board of Agriculture.

All members present, except Messrs. Fisher and Nordman.

Minutes of meetings of Board of Managers held since last meeting of Board were read and approved.

The Secretary reported the engagement of "Madam Marantette" as special feature at State Fair, at $500.00.

On motion of Mr. Wylie, Mr. Watrous was requested to endeavor to secure appointments as deputies for Mr. Raymond and one other employee of the Board from the Sheriff of Milwaukee County, for purpose of protection of Grounds.

Voted, to move fence so as to enclose the piece of ground recently occupied by the C. & N. W. Ry. Co., and Mr. Raymond was authorized to secure bids for doing such work.

On motion of Mr. Roessler, the Board of Managers was instructed to put in arches for illumination of Grounds at an expense limited to $1,000.00.

On motion of Mr. Cox, no horses are to be pastured on Fair Grounds.

Secretary was authorized to renew contract with Parke-Davis Company for disinfecting buildings and Grounds for the coming Fair.

Mr. Nelson, from Committee on Fire Works, submitted report of progress.

Miss Robinson, representing Western Vaudeville Association, was, on motion of Mr. Roessler, allowed to substitute the "Judge, Dacoma, Judge" Act for "La Tell Sisters" as a special attraction at State Fair, at same price. Miss Robinson offered, without expense, as an attraction at Fair, "Esmerelda, Xylophone Soloist." Offer accepted with thanks.

On motion of Mr. Roessler, the Board of Managers was instructed to connect the water mains upon the Grounds with the West Allis mains upon terms stated by Mayor Walsh, and on motion of Mr. Watrous, a vote of thanks was extended to the City of West Allis for the privilege.

The Secretary was authorized to contract for single line telephone at residence on Grounds.

On motion of Mr. Scott, the Board of Managers was instructed to provide an additional refrigerator for foreign cheese in Dairy Building.

The Board of Managers was instructed to assign space in a body, for all newspapers and periodicals represented at the Fair.

On motion of Mr. Hill, $1,000.00 was appropriated for evening races.

On motion of Mr. Wilcox, the Board of Managers was instructed to put in cement gutter, in place of plank one, between mile and half-mile tracks in front of Grand Stand.

On motion of Mr. Hill, the Board of Managers was instructed to have sign "Cattle" placed over front entrance to Cattle Barn—letters to be similar to those on sign on "Educational Building."

On motion of Mr. Roessler, the Superintendent of Speed was authorized to visit two race meetings in Great Western Circuit held before the time of closing of purse entries for State Fair races.

Instructed the Board of Managers to re-shingle roof of Farmers' Home Dining Hall, and to cover roofs of Feed Barn and old cattle barns with patent roofing.

On motion of Mr. Roessler, Mr. McKerrow was elected to succeed himself as a member of the Live Stock Sanitary Board.

Requisitions for material and supplies for Fair Grounds work were presented by Mr. Raymond, and approved.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, May 29.

Meeting of Board of Managers.

All members present except Mr. McKerrow.

Vice President Nelson in chair.

The minutes of last meeting of the Board read and approved.

Contracted with Wisconsin Telephone Company for telephone in residence on Grounds at $42.00 per annum.

A requisition from Mr. Raymond for lumber for fence repairs was allowed.

A contract with C. A. Brown for moving and rebuilding fence around late railroad grounds was made at $130.00.

Secretary Harbach of Milwaukee Board of Education came before the Board asking certain privileges on Grounds at time of Meet of City Schools June 6th.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, June 11.

Meeting of Board of Managers.

All members present except Mr. McKerrow.

Minutes of last meeting read and approved.

Mr. Nelson of Committee on Fire Works submitted verbal report of terms that could be made with the Pain Company, and the Secretary was instructed to contract with such Company upon conditions reported by Committee for Fire Works, Monday, Tuesday, Wednesday and Thursday evenings at an expense not exceeding $700.00 per evening.

On motion of Mr. Fisher, C. A. Brown was engaged to repair all Fair Ground fences. Prices to be paid per day—Brown $2.00, one helper $1.75, and one $1.50.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, June 25.

Meeting of Board of Managers.

All members present except Mr. McKerrow.

Minutes of last meeting read and approved.

Voted, to employ orchestra from Wisconsin Institute for the Blind, Janesville, for three days at State Fair, at $100.00.

Mr. Fisher presented plans for office for Gates Department drawn by Hilton & Sadler, Janesville, Wis., which were modified and adopted, and on motion of Mr. Cox, voted to build such office building.

Engineer Reichenbach made verbal report relative to gutter between the two tracks on Grounds, and on motion of Mr. Wylie he was instructed to make preliminary survey.

On motion of Mr. Fisher, the contract for covering roofs of three old cattle barns, and office of Superintendent of Forage was let to Mr. Heid of Jefferson at $3.80 per square, work being guaranteed for ten years.

On motion of Mr. Wylie, the Secretary was instructed to consult the Attorney General relative to legality of advertising in "Wisconsin Agriculturist."

On motion of Mr. Wylie, Bart J. Ruddle was elected Press Agent for season, at $250.00.

Mr. Roessler and Secretary True were requested to prepare a list of bands to furnish music at State Fair, and report same at next meeting.

On motion of Mr. Wylie, voted to enter into contract with D. B. Danielson to build Gates Office; move Band Stand in Grand Stand; shingle Dining Hall, and do other such work required, for a compensation of 15% above cost of labor and material.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, July 9.

Meeting of Board of Managers.

All members present except Mr. McKerrow. Messrs. Roessler and Watrous were in attendance.

Minutes of last meeting read and approved.

The Secretary reported the opinion of the Attorney General that Mr. Everett, Editor of the Wisconsin Agriculturist, being a member of the Board, did not bar the Board from using that paper as a means of advertising the Fair.

Secretary True submitted report of Committee on list of bands to be employed at coming State Fair, and the following list was selected:

Jefferson, for the week	**$375.00**
Portage, two days, one evening	**$300.00**
Wausau, two days, one evening	**$410.00**
Berlin, two days, one evening	**$465.00**
Clauders', one day, one evening	**$250.00**
Platteville, one day	**$250.00**
Janesville, one day	**$150.00**

D. B. Danielson was employed to do what concrete work may be required by Board upon same terms as other buildings, cost and 15% additional.

On motion of Mr. Cox, the Secretary was instructed to extend an invitation to the Missouri Board of Agriculture to attend our Fair in a body.

Mr. Watrous from Committee on Illumination of Grounds, submitted a report with offer of T. M. E. R. & L. Co. to construct fifty or more arches over principal streets for $8.00 per arch. (Proposition on file.) The offer was accepted, as was also a plan for the better lighting of the Live Stock Judging Pavilion, the expense of which was limited to $200.00.

Voted, to allow Superintendent Roessler, for the present season, to sell grounds for concessions in accordance with plat, where in conflict with terms of resolution passed by Board.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, July 23.

Meeting of Board of Managers.

Present—All members except Mr. McKerrow; also Messrs. Wilcox, Roessler, and Everett of Board.

Minutes of previous meeting read and approved.

The Secretary reported correspondence with Secretary of Missouri Board of Agriculture.

The report of Engineer Reichenbach upon survey for concrete gutter between race tracks, recommending that such gutter be laid to run the water North, was presented to Board, and on motion of Mr. Fisher, voted to have Mr. Donaldson put in the gutter according to recommendation and survey of engineer, iron posts for fence to be set in gutter.

Advertising in Agricultural and Live Stock papers was considered, and the following schedule of prices fixed:

Hoard's Dairyman	$100
Acker & Gartenbau Zeitung	$100
Germania	$40
Wisconsin Agriculturist	$500
Wisconsin Farmer	$40
Breeders' Gazette	$75
Farmers' Record	$15

Mr. Wilcox presented the matter of arranging for two Handicap Races at Fair,—a 2:20 Trot, and a 2:13 Pace, purse $2,000 in each race, rules to be copied from those of similar race to be given at Readsville, Mass. It was voted to arrange for such races.

Snith-Blodgett Company agreed to exchange closets in Woman's Rest Building for low pressure fixtures for an exchange price of $20.00. Offered accepted.

The Secretary was instructed to try and secure Presidential nominees Taft and Bryan to speak at State Fair.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, August 6.

Meeting of State Board of Agriculture.

All members present except Messrs. Nelson and Herbst.

Minutes of meetings of Board of Managers since May 20th read and approved.

The Secretary reported correspondence relative to effort to secure candidates Taft and Bryan, which was unfavorable.

The Secretary was instructed to correspond with officials of West Allis relative to condition of street adjoining Fair Grounds.

On motion of Mr. Everett, voted to construct track gutter so as to run water both ways from central point in front of Grand Stand, instead of all North, as Board of Managers decided to do at meeting of July 23rd.

Voted, to grant space for tent for headquarters of Animal Husbandry Department, Wisconsin College of Agriculture, and to Wisconsin Society of Equity.

Mr. Watrous and the Secretary were authorized to arrange a contract with the Wisconsin Telephone Company for services during Fair.

The Purchasing Agent was instructed to procure caps for Grounds' Police Force during Fair.

Voted, to charge Mr. Gilmore, blacksmith on Fair Grounds, $25.00 per year for rent of shop and privilege.

Voted, to contract for same light as last year from T. M. E. R. & L. Co. outside of special contracts already made, this to include searchlight.

Voted, to endorse the action of the Board of Managers in appropriating $4,000 for Handicap Races, subject to conditions approved by Board.

Mr. Fisher presented his resignation as Superintendent of Grounds, which the Board declined to accept.

Mr. Hill in chair; Mr. Everett Secretary pro tem.

On motion of Mr. Roessler conditions of Handicap Races as set forth in entry blank were accepted.

On motion of Mr. Watrous, voted to grant T. M. E. R. & L. Co. permission to erect temporary power house, and that Secretary notify the Company of this action.

The Superintendent of Grounds was authorized to have the two empty flower beds suitably filled before the Fair.

On motion of Mr. Watrous, voted to allow Mr. F. D. Fulton $50.00 for services rendered in connection with Speed Department, and advertising same.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, August 13.

Meeting of Board of Managers.

All members present except Mr. Nelson.

Minutes of Board read and approved.

Secretary was authorized to make arrangements for connecting with West Allis water mains. Size of tap, six inches.

The Secretary reported that the Missouri Board of Agriculture announces that it will visit the Wisconsin State Fair, and as soon as he ascertains date of visit he is authorized to secure lodgings for the visitors.

The Secretary was instructed to extend a vote of thanks to the Railroad Companies giving reduced rates to the Fair.

Superintendent of Grounds Fisher was instructed to construct tank at point of discharge of sewage from Office building.

Purchase of Stock Scales was laid over until next meeting.

Press Agent Ruddle was authorized to get out advertising, both for distribution throughout the State and also for window-sheets for Milwaukee, the latter not to exceed $50.00.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, Aug. 19.

Meeting of Board of Managers.

All members present except Mr. Nelson.

On motion of Mr. Cox, voted to purchase a five ton Stock Scale of Fairbanks-Morse Co., Chicago, Ill., steel foundation, for $105.00, complete, the Board to put in the pit.

Voted, to admit tent of "Publicity Department" of State of Idaho free of charge.

Contracted with Wadham's Oil Co. for one tank of oil for coating streets, at three cents per gallon f. o. b. cars at Fair Grounds, the Company's guarantee that work shall be satisfactory, being given.

Mr. Watrous was authorized to contract with T. M. E. R. & L. Co. for two electric signs on Grand Avenue Bridge, Milwaukee, advertising the coming State Fair.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, Sept. 3.

Meeting of Board of Agriculture.

Present—Messrs. Wylie, Fisher, Everett, Cox, Watrous, McKerrow, Herbst, Wilcox and Scott.

Gentlemen asking for advertising privilege by distribution of cards, came before the Board. Request declined as violation of rules.

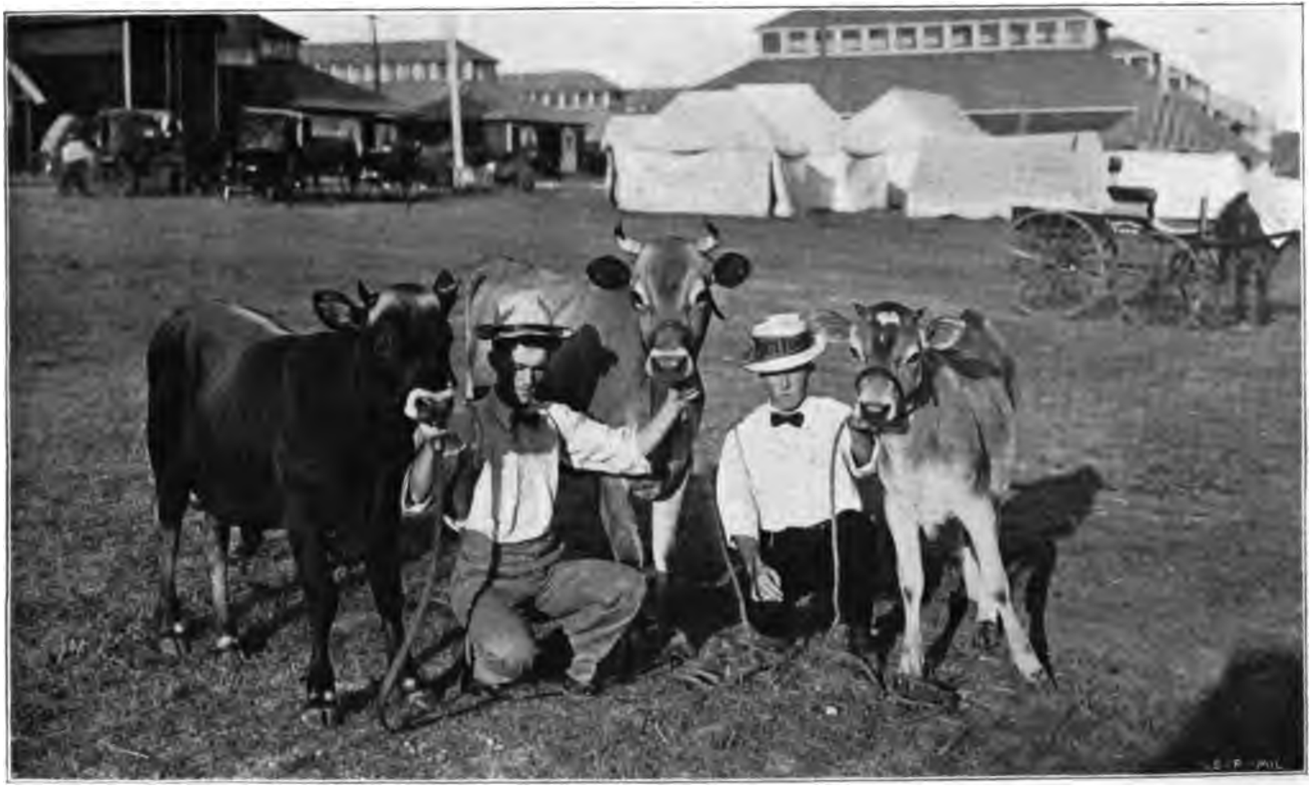
Voted, to make Friday, September 11, "Children's Day" when children under sixteen years of age will be admitted without the use of tickets.

The President was authorized to secure a special judge of Tamworth Swine.

Mr. Wylie presented the following resolution, which was adopted:—

"RESOLVED, That hereby is appropriated to each member of the State Board of Agriculture a sum not exceeding fifty dollars, for the purpose of promoting the interests of his respective department, and the State Fair as a whole."

The Secretary was instructed to issue free Auto tickets to Governor James O. Davidson, Mayor D. S. Rose, John I.



Jersey Group.

Beggs, and President Burt of the Wisconsin Telephone Company.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, Sept. 5.

Eleven members present.

The protest of Racine Sattley Co. relative to use of space adjoining its exhibit, laid on table.

Dr. F. R. Wright was elected official physician during Fair, at salary of $50.00

Voted, that all supplies bought, be on approval of President.

Voted, to pay three men of West Allis Fire Department $2.00 per day, and meals, for services during Fair.

Voted, to give Matinee Harness Races each evening during Fair, amount for each race being limited to $50.00.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds Sept. 9.

Quorum present.

On motion of Mr. Fisher, the sum of $45.00 was set aside for Suffolk Horses, the same being removed from "Belgian and Other Draft Breeds" Class.

On motion of Mr. Everett, speed of autos upon Grounds during Fair, limited to four miles per hour.

On motion of Mr. Cox, voted to investigate loss of property from Grounds since last Fair.

Adjourned.

September 10.

Quorum present.

The management of defense of an injunction suit, started on complaint of Robert Lawler against Board for refusal to allow sale of certain alleged temperance drinks, was placed in the hands of President McKerrow.

On motion of Mr. Hill, the advertising of all spirituous or malt liquors on Fair Grounds was prohibited.

Protest of Mr. J. McD. Randles against allowing horses entered by Progress Blue Ribbon Farms, was on suggestion of Mr. Wylie, overruled.

September 11, Morning.

Quorum present.

Parties running concessions under Grand Stand having been found selling liquor, voted to prosecute same.

The Secretary was instructed to collect rent for seven horse stalls, amounting to $21.00, from Progress Blue Ribbon Farms, and for violation of rules in removing stock on exhibition from Grounds, without permission, same exhibitor was barred from again exhibiting for one year.

Adjourned.

September 11, Afternoon.

Quorum present.

The Secretary was instructed to notify Charles E. Dean that $200.00 pledged by him in re-adjustment of 2:13 Pace is hereby refunded in consideration of services rendered in "Exhibition Heat" of "Minor Heir."

On motion of Mr. Fisher, voted to pay members of Handicap Committee five dollars per day for services and expenses incurred in performance of such work.

On motion of Mr. Cox, Superintendent Fisher was requested to personally attend to the housing and caring for property of the Board, and he was instructed to prepare an inventory of such property for future use.

Adjourned.

JOHN M. TRUE,
Secretary.

Fair Grounds, Sept. 17.

Meeting of Board of Managers.

All members present except Mr. Cox.

Bills for audit were presented by the Secretary.

Voted, to grant to Milwaukee Automobile Club the use of the track and Grounds for a Meet September 25 and 26, at

$100.00 per day; Board to provide for sprinkling of track, and placing of chairs in Grand Stand boxes.

Adjourned.

JOHN M. TRUE,
Secretary.

Madison, Sept. 28.

Meeting of Board of Managers.

The question of the settlement or continuance of contest in injunction suit, started at time of State Fair, was considered and the Board voted that in case a complete settlement of case could now be obtained without any claim for damages, to drop the suit.

Recess.

Mr. McKerrow absent.

On motion of Mr. Cox, voted to employ another man as custodian of Fair Grounds in place of Mr. Raymond, whose term of positive engagement terminates September 30, that in case Superintendent of Grounds Fisher cannot at that time relieve Mr. Raymond, that Mr. Wylie do so, and that he remain at Grounds until relieved by Mr. Fisher, or by action of the Board of Managers.

Adjourned.

JOHN M. TRUE,
Secretary.

Madison, Oct. 6.

Meeting of Board of Managers.

All members present except Mr. Cox.

It was voted that Superintendent of Grounds Fisher of the Board, serve the following statement and notice upon Mr. Raymond, late custodian of Fair Grounds.

"You are hereby notified that at a meeting of the Board of Managers of the Wisconsin State Board of Agriculture held September 28, 1908, in accordance with the action of such Board at its Annual Meeting held March 3, 1908, at which meeting the following resolution was adopted:—

"RESOLVED, That Mr. Raymond be chosen custodian of Fair Grounds for six months from the first of April, at $50.00 per month, he to be retained for balance of year if his services are satisfactory to the Board of Managers," and it was voted to dispense with your services at the end of six months service, i. e., October 1st, 1908; the ground for such dismissal being that you have proved incompetent in your position.

You are notified to, at once, turn over to Superintendent of Grounds Fisher, all keys to buildings, and moneys in your possession, and to vacate the premises now occupied, within thirty days of the service of this notice.

Signed,

GEORGE MCKERROW,
JAMES J. NELSON,
GEORGE WYLIE,
GRANT U. FISHER,
Board of Managers.

On motion of Mr. Wylie, C. A. Brown was elected custodian of Fair Grounds until April 1st, 1909, at $50.00 per month.

Adjourned.

JOHN M. TRUE,
Secretary.

Madison, Nov. 11,
10 o'clock, A. M.

Meeting of State Board of Agriculture.

Present—Messrs. Mylie, Roessler, Cox, McKerrow, Herbst, Hill, Nelson, Nordman and Scott.

Absent—Messrs. Fisher, Everett, Watrous and Wilcox.

Minutes of recent meetings of the Board of Managers read and approved.

Dr. Silverston of Milwaukee presented the following request:

"Gentlemen: I would ask permission to erect a building near the North East gate of the Fair Grounds, between the fence and the race-track, suitable for my purpose—of experimenting and building of Air Ships. and will pay a reasonable rental for same—say $200.00 during Fair week each year, and would suggest that for the protection of the Grounds, myself or watchman be given police power, without compensation."

On motion of Mr. Wylie, voted to grant lease asked for, for one year, the location to be fixed by the Board of Managers.

On motion of Mr. Cox, voted to hold Annual Convention during the first week in February, and that the President, Secretary and Mr. Hill constitute the Committee on Arrangements.

Recess taken until 1:30 p. m.

1:30 P. M.

Assistant Attorney General Titus came before the Board and gave legal advise relative to action of the Board in removal of Mr. Raymond from position of custodian of Grounds.

The following resolution was adopted:—

"Whereas, since the last meeting of this Board, the Board of Managers acting under authority given it by this Board at its Annual Meeting, held March 3rd, 1908, has dismissed Mr. Raymond from his position of custodian of Fair Grounds, and elected Mr. C. A. Brown in his place for the remainder of the year,

RESOLVED, That this Board hereby expresses its full approval of such action of the Board of Managers."

President McKerrow, Messrs. Hill, Wylie; Scott and Roessler were chosen delegates to Annual Meeting of American Association of Fairs and Expositions to be held in Chicago, December 3, 1908, and the selecting of Secretary John M. True, by American Association, as the representative of this Board upon committee to recommend Fair dates, at meeting of Association, was approved.

Messrs. McKerrow, Wylie and Hill were made a committee to solicit special premiums for next year, from Live Stock Breeders' Associations.

Mr. Hill presented testimonial from Live Stock exhibitors at last State Fair, asking for the re-election of President McKerrow and Secretary True by the Board, and the same was ordered placed on file.

The Secretary was authorized to revise Educational Premium list for next State Fair that they be published soon; amount to be offered in premiums not to be raised from this year's list.

A legislative committee consisting of Messrs. McKerrow, Nelson, Wylie, Roessler and Secretary True, was created.

Adjourned.

JOHN M. TRUE,
Secretary.

Madison, Feb. 2, 1909.

Special Meeting of State Board of Agriculture.

All members present except Mr. Mac Laren.

A communication from the High Schools of the City of Milwaukee, relative to use of Fair Grounds for Athletic Meet May 15, was presented by the Secretary.

On motion of Mr. Roessler, permission was granted for a rental of $25.00.

The President named as Committee to audit financial books at close of fiscal year, Messrs. Wylie, Hill and Wedgwood.

The Committee on "State Fair" met with the Board in conference relative to appropriation for improvements upon Fair Grounds by present legislature, and it was mutually agreed to ask for the following:—

Addition to Executive Building	$ 2.500 00
Dairy Building	35,000 00
Fish Exhibit Building	3,000 00
Woman's Work and Art Building	30,000 00
Two Toilets	3,000 00
Streets and Walks	5,000 00
Posts and Wires for Lighting	4,000 00
Repairs	5,000 00
Model Farm Barn	3,000 00
Model Rural School House	1,500 00
Educational Building	15,000 00
Shed for Vehicle Exhibit	35,000 00
Section of Grand Stand	18,000 00
	$160,000 00

Adjourned.

JOHN M. TRUE,
Secretary.

SECRETARY'S REPORT.

Receipts for the year ending March 1st, 1909, are as follows:

From the State	$8,097 04
From Gates Department	42,277 27
From Grand Stand Department	11,559 85
From Speed Department	9,752 25
From Privileges	15,256 61
From Forage Department	1,717 57
From Transportation Department	70 00
From entries, stall and pen rents	2,794 76
From sale of Supply Wagon tickets	156 00
From sale of tickets to firms	270 35
From sale of Dairy Exhibits	1,162 82
From Special Premiums	2,461 40
From All Other Sources	3,244 81
	$98,770 73

Disbursements have been as follows:

Paid Premiums—Horse Department	$6,340 00	
Paid Premiums—Cattle Department	8,086 00	
Paid Premiums—Sheep Department	3,632 00	
Paid Premiums—Swine Department	3,146 00	
Paid Premiums—Poultry and Pigeons	1,535 75	
Paid Premiums—Agriculture	763 00	
Paid Premiums—Farm Exhibits	979 00	
Paid Premiums—Horticulture	1,262 00	
Paid Premiums—Dairy Department	2,090 00	
Paid Premiums—Art Department	582 00	
Paid Premiums—Woman's Work	640 00	
Paid Premiums—Educational Department	454 50	
Total Premiums		$29,510 25
Speed Purses (Reported)		20,770 00

Paid for Improvements	$14,787 73
Paid for Newspaper advertising	4,687 64
Paid for Other advertising	2,575 95
Paid for Special Attractions	8,250 00
Paid for Music	4,704 80
Paid for Superintendents and Assistants	4,217 00
Paid for Judges	1,167 18
Paid Expenses of Board	999 57
Paid in Secretary's Office	2,973 50
Paid Secretary's help at Fair	870 00
Paid for premium ribbons and badges	767 85
Paid Expenses Grounds Department	842 00
Paid Expenses Gates Department	1,145 60
Paid Expenses Grand Stand Department	721 50
Paid Expenses Marshal's Department	1,755 56
Paid Labor on Grounds	4,031 83
Paid for All Other Expenses	7,271 46
Total Disbursements	$112,029 42

SECRETARY'S SUMMARY.

Amount in Treasury March 1st, 1908	$28,175 72	
Receipts since that date	98,770 73	
	$126,946 45	
Disbursements during year		$112,029 42
Balance on hand March 1st, 1909		14,917 03
		$126,946 45

JOHN M. TRUE,
Secretary.

TREASURER'S REPORT.

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF THE WISCONSIN STATE BOARD OF AGRICULTURE.

STATE OF WISCONSIN,
Treasury Department,
MADISON, WIS., March 1, 1909.

Balance in Treasury March 1st, 1908........	$28,175 72	
Receipts during year	98,770 73	
	$126,946 45	
Disbursements during year	112,029 42	
Balance on hand March 1st, 1909........................		$14,917 03

A. H. DAHL,
State Treasurer.

Madison, March 1.

Special Meeting of Board of Agriculture.

Present—Messrs. Wylie, Fisher, Roessler, Cox, McKerrow, Hill, Herbst, Wedgwood, Nordman and Scott.

The Secretary submitted his Financial Report and that of the State Treasurer, and the Committee of Audit reported as follows:

"The Committee of Audit has compared the financial report of the Secretary and the books upon which it is based, with the report of the State Treasurer, and find the same correct and in substantial agreement with each other."

GEORGE WYLIE,
CHAS. L. HILL,
DAVID WEDGWOOD,
Committee.

Adjourned.

JOHN M. TRUE,
Secretary.

SECRETARY'S FINANCIAL STAT

RECEIPTS.

APRIL.

No. From whom and for what.

1. S. S. Athletic League, rent of grounds for meet
2. American Trotting Assoc., suspension speed.....
3. Moline Plow Co., entry fee......................

Total ....

MAY.

4. A. Miksche, suspension speed...................
5. Lindsay Bros., overpayment on harrow.........
6. Anderson Vehicle Co., entry fee................

Total ....

JUNE.

7. Enterprise Mfg. Co., entry fee..................
8. Brown Sehler Co., entry fee......................
9. William Fox, entry fee..........................
10. Heitman & Baerman, entry fee..................
11. Milwaukee Academy, rent of grounds..........
12. C. A. Burris, suspension speed..................
13. Alex Klokner, entry fee.........................
14. Rudolph Preuss, entry fee.......................
15. Thos. S. Kerr, speed entry......................
16. Newspaper checks, returned.....................
17. Reliance Iron & Engine Co., entry fee..........
18. Milwaukee High School, rent of grounds........
19. Gehl Bros., Mfg. Co., entry fee................

Total ....

JULY.

No.	From whom and for what.	Amount
20.	Vermont Farm Machine Co., entry fee	$2 00
21.	Newspaper check, returned	3 00
22.	Newspaper check, returned	3 00
23.	E. W. Ross Co., entry fee	2 00
24.	H. Raymond, collections	117 00
25.	W. A. McHenry, entry fee	2 00
26.	Iowa Dairy Separator Co., entry fee	2 00
27.	W. E. Dallwig, entry fee	2 00
28.	Arcadian Malleable Range Co., entry fee	2 00
29.	Fred C. Kaiser, entry fee	2 00
30.	The S. Freeman & Sons Co., entry fee	2 00
31.	State Treasurer, cancelled draft	10 00
32.	A. McDonald, withdrawal speed	150 00
33.	Edmondson Concrete Machine Co., entry fee	2 00
	Total	$301 00

AUGUST.

No.	From whom and for what.	Amount
34.	Vincent C. Maertz, coop rent	$2 50
35.	E. E. Schmidt, withdrawal speed	150 00
36.	L. H. Mabury, withdrawal speed	150 00
37.	J. R. Patton, withdrawal speed	150 00
38.	W. J. Moyle, entry fee	2 00
39.	Newkirk & Bailey, withdrawal speed	150 00
40.	Ida L. Kuehn, entry fee	2 00
41.	J. W. Rosendale, withdrawal speed	150 00
42.	Hans Berg, entry and stall rent	12 00
43.	H. Raymond, collections	65 00
44.	Fairbanks-Morse Co., entry fee	2 00
45.	Automatic Carrier Co., entry fee	2 00
46.	Mrs. E. A. Arthur, entry fee	2 00
47.	Gust Schreiber, entry fee	2 00
48.	Mrs. L. C. Baker, entry fee	2 00
49.	J. G. Hickcox, entry fee	2 00
50.	Henry Tennessen, entry fee	2 00
51.	Adam Seitz, entry and stall rent	17 00
52.	St. Paul Ditcher & Carrier Co., entry	2 00
53.	Gottfried Vogel, entry fee	2 00
54.	Kingman & Co., entry fee	2 00
55.	U. M. Iverson, coop rent	2 50
56.	J. H. Field, entry fee	2 00
57.	Mrs. E. E. Mills, entry fee	2 00
58.	Heck Bros., entry fee	2 00

No.	From whom and for what.
59.	A. W. & F. E. Fox, entries and stall rent....
60.	C. C. Watts, withdrawal speed..............
61.	Mrs. Thomas Bowes, entry fee..............
62.	W. M. Jones, entry fee.......................
63.	Gilson Mfg. Co., entry fee....................
64.	Christian J. Schneider, entry fee............
65.	G. M. Matznick, entry fee....................
66.	William Sy, Jr., entry fee.....................
67.	Ed. Maedke, entry fee..........................
68.	Beaver Dam Mfg. Co., entry fee.............
69.	Creamery Package Mfg. Co., entry fee.......
70.	Dr. Lewis A. Nolte, entries....................
71.	Sleep Bros., entry and stall rent.............
72.	F. J. Lindley, entry fee.......................
73.	J. J. Kuhn, entry fee..........................
74.	Geo. W. Bean, entry fee.......................
75.	Louise Hasse, entry fee........................
76.	Frank Bowar, entry fee.........................
77.	Mrs. John T. Unertl, entry and stall rent.....
78.	Mrs. A. R. Radtke, entry fee..................
79.	Geo. J. Schuster, entry fee....................
80.	Casper Anderegg, entry fee....................
81.	American Trotting Assoc., collections........
82.	Samuel Weiler, entry fee.......................
83.	Mrs. Adda F. Howie, entry and stall rent....
84.	James G. Boyd, entry fee......................
85.	The J. B. Rowell Co., entry fee..............
86.	Mina W. Nolte, entry fee......................
87.	Vincent C. Maertz, entry fee..................
88.	Nim Johnson & Son, entry fee...............
89.	Neal Houslet, entry and stall rent............
90.	H. W. Ayers, entry fee.........................
91.	A. E. Rundell, entry and stall rent...........
92.	Paul Borham, entry fee........................
93.	Robert Naumann, entry fee....................
94.	Fox & Gallagher, entry fee....................
95.	William Smiley, entry fee.....................
96.	W. G. Bartholf, entry fee.....................
97.	Geo. H. Simpson, entry fee...................
98.	C. M. Mason, entry and stall rent............
99.	Finch Bros., entry fee.........................
100.	William C. Lindow, entry fee................
101.	Muskego Lakes Jersey Herd, entry and stall r
102.	Geo. K. Wenig, withdrawal speed............
103.	J. R. Love, entry fee..........................

No.	From whom and for what.	Amount
104.	Milwaukee Gardeners' Assoc., entry fee	2 00
105.	J. E. Bales & Son, entry fee	2 00
106.	Logan W. Black, entry and stall rent	32 00
107.	E. R. Thomas, entry fee	2 00
108.	H. U. Hainline, entry and pen rent	6 50
109.	Henry J. Stoltenberg, entry fee	2 00
110.	W. P. Dunlap, entry fee	2 00
111.	A. A. Martin, entry fee	2 00
112.	Walter Harnischfeger, entry and stall rent	6 00
113.	Lewis Lewellin & Son, entry and stall rent	27 00
114.	Lewis Roberts, entry fee	2 00
115.	Dr. David Roberts, entry fee	2 00
116.	Joseph Allyn, entry and stall rent	18 00
117.	Heath Stock Farm, entry and stall rent	16 00
118.	Rust Bros., entry and stall rent	22 00
119.	Scott Deaner, entry fee	2 00
120.	Jacob Slimmer, entry fee	2 00
121.	Sam Jones & Son, entry fee	2 00
122.	Ed. Wuensch, entry fee	2 00
123.	W. S. Walsh, entry fee	2 00
124.	Robert Burgess & Son, entry and stall rent	68 00
125.	Arthur Ott, entry and stall rent	6 00
126.	Mrs. F. Luedke, entry fee	2 00
127.	Jos. B. McCullom, entry and pen rent	7 00
128.	J. F. LeJeune, entry fee	2 00
129.	E. H. Kielsmeier, entry fee	2 00
130.	Mrs. Delia Wangemann, entry fee	2 00
131.	J. C. Land, entry and stall rent	5 00
132.	Shaver & Ducker, entry fee	2 00
133.	Adolph P. Arp, entry fee	2 00
134.	Albert Guenther, entry and stall rent	6 00
135.	W. H. Putnam, entry fee	2 00
136.	Mrs. William Sweeney, entry fee	2 00
137.	Alex Stewart Lumber Co., entry fee	2 00
138.	Geo. Martin, entry, stall and pen rents	18 00
139.	J. C. Robinson, entry fee	2 00
140.	A. R. Radtke, entry fee	2 00
141.	R. Connor Co., entry and stall rent	18 00
142.	McLay Bros., entry fee	2 00
143.	F. S. Bunker, entry fee	2 00
144.	Geo. F. Carroll, entry and stall rent	8 00
145.	Pabst Stock Farm, entry and stall rent	60 00
146.	Progress Blue Ribbon Farms, entry fee	2 00
147.	Fred Southcott, entry, stall and pen rent	25 50

No.	From whom and for what.
148.	Roy Southcott, entry and stall rent
149.	A. R. Ives, entry fee
150.	R. S. Witte, entry fee
151.	John T. Edwards, entry fee
152.	T. S. Simpson & Sons, entry fee
153.	W. Woodard, entry fee
154.	Fred S. Hadler, entry fee
155.	Mrs. Edna S. Sinsel, entry fee
156.	Fred Vogel, Jr., entry fee
157.	J. H. Greene, entry and stall rent
158.	T. W. Curtis & Son, entry and stall rent
159.	A. W. Dopke, entry and stall rent
160.	Howard Greene, entry and stall rent
161.	A. C. Demerit & Son, entry and stall rent
162.	G. N. Mihills, entry fee
163.	J. McD. Randles, entry fee
164.	L. Dabareiner, entry fee
165.	Milwaukee Machinery Co., entry fee
166.	Lucy Cavell, entry fee
167.	F. H. Meekin & Son, entry and pen rent
168.	W. P. Dunlap, stall rent
169.	Renk Bros., entry and pen rent
170.	Baker Mfg. Co., entry fee
171.	Robert Hardy, entry fee
172.	S. M. Quaw, entry and stall rent
173.	Marinette County Insane Asylum, entry and
174.	Jacob Baehler, entry fee
175.	H. W. Kuchen, entry fee
176.	S. M. Quaw, stall rent
177.	Geo. Ineichen & Son, entry fee
178.	E. T.—E. S. Hilton Co., entry fee
179.	W. P. Dunlap, entry fee
180.	Harold A. Lewis, entry fee
181.	Nick Bruehl, entry fee
182.	Robert E. Haylett, entry fee
183.	Geo. A. Philippi, entry and pen rent
184.	Albert F. Koopman, Jr., entry fee
185.	C. F. Langkilde, entry fee
186.	E. R. Whitcomb, entry fee
187.	D. C. Patton, entry and pen rent
188.	Jos. H. Barr, entry fee
189.	Chas. H. Good, entry fee
190.	Mrs. C. G. Leen, entry fee
191.	Henry A. Sonnabend, entry fee

No.	From whom and for what.	Amount
192.	W. W. Vaughn & Son, entry fee	2 00
193.	Griem & Hepke, entry fee	2 00
194.	F. H. Patten, entry fee	2 00
195.	Arthur Ott, balance stall rent	2 00
196.	Mrs. Giles Hibbard, entry fee	2 00
197.	Mrs. A. LeFeber, entry fee	2 00
198.	Walter Bean, entry fee	2 00
199.	E. M. Moore, entry fee	2 00
200.	H. E. Moore, entry fee	2 00
201.	A. H. Haberstick, entry fee	2 00
202.	Rumquist & Elliott, withdrawal speed	45 00
203.	Fred W. Koller, entry fee	2 00
204.	C. H. Chandler, entry fee	2 00
205.	Mrs. O. F. Priebe, entry fee	2 00
206.	Otto Freund, entry fee	2 00
207.	Edw. Helmke, entry fee	2 00
208.	Chas. H. Prust, entry fee	2 00
209.	J. J. Jackson, entry fee	2 00
210.	A. E. Woodstock, entry fee	2 00
211.	J. Rothenbach, entry fee	2 00
212.	Mary Pitzke, entry fee	2 00
213.	J. L. Jones, entry and pen rent	3 50
214.	A. N. Kelly, entry fee	2 00
215.	Oscar Huber, entry fee	2 00
216.	Chas. H. Howitt, entry fee	2 00
217.	E. L. Benedict, entry fee	4 00
218.	L. M. Kohel, entry fee	2 00
219.	C. E. Potter, entry fee	2 00
220.	F. W. Nussbaumer, entry fee	2 00
221.	H. J. Kuchel, entry fee	2 00
222.	Uriah Cook & Son, entry fees	4 00
223.	E. O. Siggelkow, entry fee	2 00
224.	A. J. Oleson, entry fee	2 00
225.	John G. Kennedy, entry fee	2 00
226.	R. L. Adams, entry fee	2 00
227.	E. B. Conover, withdrawal speed	150 00
228.	Jacob Alder, entry fee	2 00
229.	Calumet Dairy Co., entry fees	4 00
230.	Frank Shersmith, entry fee	2 00
231.	F. H. Joseph, entry fee	2 00
232.	Anton Loehr, entry fee	2 00
233.	The Chas. Skidd Mfg. Co., entry fee	2 00
234.	Mrs. William Claridge, entry fee	2 00
235.	Frederick Stoltenberg, entry fee	2 00

No.	From whom and for what.
148.	Roy Southcott, entry and stall rent..............
149.	A. R. Ives, entry fee..............................
150.	R. S. Witte, entry fee.............................
151.	John T. Edwards, entry fee.........................
152.	T. S. Simpson & Sons, entry fee....................
153.	W. Woodard, entry fee..............................
154.	Fred S. Hadler, entry fee..........................
155.	Mrs. Edna S. Sinsel, entry fee.....................
156.	Fred Vogel, Jr., entry fee.........................
157.	J. H. Greene, entry and stall rent.................
158.	T. W. Curtis & Son, entry and stall rent........
159.	A. W. Dopke, entry and stall rent..............
160.	Howard Greene, entry and stall rent.............
161.	A. C. Demerit & Son, entry and stall rent.......
162.	G. N. Mihills, entry fee...........................
163.	J. McD. Randles, entry fee.........................
164.	L. Dabareiner, entry fee...........................
165.	Milwaukee Machinery Co., entry fee.............
166.	Lucy Cavell, entry fee.............................
167.	F. H. Meekin & Son, entry and pen rent........
168.	W. P. Dunlap, stall rent...........................
169.	Renk Bros., entry and pen rent..................
170.	Baker Mfg. Co., entry fee..........................
171.	Robert Hardy, entry fee............................
172.	S. M. Quaw, entry and stall rent................
173.	Marinette County Insane Asylum, entry and pen
174.	Jacob Baehler, entry fee...........................
175.	H. W. Kuchen, entry fee............................
176.	S. M. Quaw, stall rent.............................
177.	Geo. Ineichen & Son, entry fee....................
178.	E. T.—E. S. Hilton Co., entry fee...............
179.	W. P. Dunlap, entry fee............................
180.	Harold A. Lewis, entry fee.........................
181.	Nick Bruehl, entry fee.............................
182.	Robert E. Haylett, entry fee.......................
183.	Geo. A. Philippi, entry and pen rent............
184.	Albert F. Koopman, Jr., entry fee...............
185.	C. F. Langkilde, entry fee.........................
186.	E. R. Whitcomb, entry fee..........................
187.	D. C. Patton, entry and pen rent................
188.	Jos. H. Barr, entry fee............................
189.	Chas. H. Good, entry fee...........................
190.	Mrs. C. G. Leen, entry fee.........................
191.	Henry A. Sonnabend, entry fee....................

No.	From whom and for what.	Amount
192.	W. W. Vaughn & Son, entry fee	2 00
193.	Griem & Hepke, entry fee	2 00
194.	F. H. Patten, entry fee	2 00
195.	Arthur Ott, balance stall rent	2 00
196.	Mrs. Giles Hibbard, entry fee	2 00
197.	Mrs. A. LeFeber, entry fee	2 00
198.	Walter Bean, entry fee	2 00
199.	E. M. Moore, entry fee	2 00
200.	H. E. Moore, entry fee	2 00
201.	A. H. Haberstick, entry fee	2 00
202.	Rumquist & Elliott, withdrawal speed	45 00
203.	Fred W. Koller, entry fee	2 00
204.	C. H. Chandler, entry fee	2 00
205.	Mrs. O. F. Priebe, entry fee	2 00
206.	Otto Freund, entry fee	2 00
207.	Edw. Helmke, entry fee	2 00
208.	Chas. H. Prust, entry fee	2 00
209.	J. J. Jackson, entry fee	2 00
210.	A. E. Woodstock, entry fee	2 00
211.	J. Rothenbach, entry fee	2 00
212.	Mary Pitzke, entry fee	2 00
213.	J. L. Jones, entry and pen rent	3 50
214.	A. N. Kelly, entry fee	2 00
215.	Oscar Huber, entry fee	2 00
216.	Chas. H. Howitt, entry fee	2 00
217.	E. L. Benedict, entry fee	4 00
218.	L. M. Kohel, entry fee	2 00
219.	C. E. Potter, entry fee	2 00
220.	F. W. Nussbaumer, entry fee	2 00
221.	H. J. Kuchel, entry fee	2 00
222.	Uriah Cook & Son, entry fees	4 00
223.	E. O. Siggelkow, entry fee	2 00
224.	A. J. Oleson, entry fee	2 00
225.	John G. Kennedy, entry fee	2 00
226.	R. L. Adams, entry fee	2 00
227.	E. B. Conover, withdrawal speed	150 00
228.	Jacob Alder, entry fee	2 00
229.	Calumet Dairy Co., entry fees	4 00
230.	Frank Shersmith, entry fee	2 00
231.	F. H. Joseph, entry fee	2 00
232.	Anton Loehr, entry fee	2 00
233.	The Chas. Skidd Mfg. Co., entry fee	2 00
234.	Mrs. William Claridge, entry fee	2 00
235.	Frederick Stoltenberg, entry fee	2 00

No.	From whom and for what.
236.	J. L. Frank, entry fee ....
237.	Gilbert Horton, entry fee and pen rent ....
238.	Mrs. Robert Ramsey, entry fee ....
239.	A. J. Schulte, entry fee ....
240.	Ernst Boll, entry fee ....
241.	N. L. Rapp, entry fee ....
242.	P. W. Gluse, entry fee ....
243.	Elmer Termaat, entry fee ....
244.	G. E. Melendy, entry fee ....
245.	Andrew Lindokken, entry fee ....
246.	O. W. Massie, withdrawal speed ....
247.	Mrs. E. L. Douville, entry fee ....
248.	T. J. Warner, entry fee ....
249.	Thos. O'Neil, entry fee ....
250.	Math Meyer, entry fee ....
251.	Guy Tyler, entry fee ....
252.	M. H. Reed, entry fee ....
253.	Helendale Farms, entry fee ....
254.	Christian Bigler, entry fee ....
255.	Aug. F. Westphal, entry fee ....
256.	O. A. Kielsmeier, entry fee ....
257.	R. C. Kielsmeier, entry fee ....
258.	Robert Kohli, entry fee ....
259.	J. L. Zehren, entry fee ....
260.	F. J. Haack, entry fee ....
261.	Jos. K. Barta, Jr., entry fee, Dept. E.........
262.	Void.
	Total ....

SEPTEMBER.

No.	From whom and for what.
263.	C. J. Jensen, entry fee ....
264.	A. C. Ellicksen, entry fee ....
265.	William P. Sterns, entry fee ....
266.	Chas. Rasmussen, entry fee....................
267.	Mrs. Abbie Prisk, entry fees ....
268.	William Haag, entry fee ....
269.	A. H. Knoke, entry fee ....
270.	F. J. Strathman, entry fee ....
271.	R. Conrad, entry fee ....
272.	Ella M. Goelzer, entry fee ....
273.	Mrs. A. J. Beduhn, entry fee ....
274.	Charles Theurer, entry fee ....
275.	E. A. Siggelkow, entry fee ....

No.	From whom and for what.	Amount
276.	William Zimmerman, entry fee	2 00
277.	Theo. W. Schreiber, entry fee	2 00
278.	William McMorran, entry fee	2 00
279.	Emil Widder, entry fee	2 00
280.	L. F. Hoppe, entry fee	2 00
281.	F. A. Viergutz, entry fee	2 00
282.	Mrs. L. W. Barnes, entry fee	2 00
283.	A. L. Kleeber, entry fee	2 00
284.	J. F. Kalk, entry fee	2 00
285.	Chas. Alswede, entry fee	2 00
286.	Francisco Spicuzza, entry fee	2 00
287.	Herman Dusell, entry fee	2 00
288.	Bishop & Esterly, entry fee	2 00
289.	Gottlieb Muehleisen, entry fee	2 00
290.	Mrs. S. W. Poppe, entry fee	2 00
291.	Mrs. W. P. Wegner, entry fee	2 00
292.	John Reis, entry fee	2 00
293.	J. A. Fuller, entry fee	2 00
294.	Jacob Andrea, entry fee	2 00
295.	A. H. Kittinger, entry fee	2 00
296.	Mrs. N. Lindquist, entry fee	2 00
297.	Chas. D. Kelly, entry fee	2 00
298.	Edna J. Wade, entry fee	2 00
299.	J. W. Justice, entry fee	6 00
300.	Bertha Puerner, entry fee	2 00
301.	R. W. Chatterton, entry fee	2 00
302.	Geo. E. Kelly, entry fee	2 00
303.	C. C. Roup, entry fee	7 00
304.	C. H. Howitt, entry fee	2 00
305.	N. M. Jewell & Son, entry fee	2 00
306.	Edna Simonton, entry fee	2 00
307.	Geo. Schuster, stall rent	16 00
308.	Mrs. E. S. Hoffman, entry fee	2 00
309.	R. S. Witte, stall rent	15 00
310.	Marjorie Falbe, entry fee	2 00
311.	Mrs. F. J. Heyder, entry fee	2 00
312.	John Grape, entry fee	2 00
313.	Justin Grape, entry fee	2 00
314.	J. H. Pagel, entry fee	2 00
315.	Minnie Dykins, entry fee	2 00
316.	Mrs. C. E. Strong, entry fee	2 00
317.	Robert Pilgrim, entry fee	2 00
318.	J. H. Pilgrim, entry fee	2 00
319.	Joseph Pilgrim, entry fee	2 00

No.	From whom and for what.
320.	J. S. Palmer, entry fee
321.	Mrs. Susie Abert, entry fee
322.	Ruth R. Shutts, entry fee
323.	John C. Hug, entry fee, Dept. E
324.	A. Spalthoff, entry fee
325.	C. Beerend, entry fee
326.	G. Schloemer, entry fee
327.	Francis Tennis, entry fee
328.	Lizzie Mayer, entry fee
329.	A. F. Petersen, entry fee
330.	Frank Kittinger, entry fee
331.	Mrs. T. W. Baker, entry fee
332.	M. G. Douma, entry fee
333.	Herman C. Lange, entry fee
334.	W. C. Palmer, entry and pen rent
335.	Fred Bauer, entry
336.	Chas. Rothel & Sons, entry and pen rent
337.	Nowak Bros., entry fee
338.	Aug. H. Blanck, entry fee
339.	C. A. Bahr, entry fee
340.	Con Roelke, entry fee
341.	Eli Crall & Son, entry and pen rent
342.	H. Williamsen, entry fee
343.	Aug. Brandt, entry fee
344.	Mrs. F. H. Riha, entry fee
345.	Edward Meracle, entry fee
346.	Mrs. Henry Fischer, entry fee
347.	Jacob Horn, entry fee
348.	W. J. Clark, entry fee
349.	A. J. Mohr, entry and pen rent
350.	L. Ellis, entry fee
351.	Sam Christensen, entry fee
352.	H. A. Main, entry fee
353.	Mrs. John Hans, entry fee
354.	Willard Mortensen, entry fee
355.	John Hans, entry fee
356.	Ben Hans, entry fee
357.	W. G. Jamison & Son, entry fee
358.	H. J. Evans, entry fee
359.	Arthur Roegner, entry fee
360.	H. Fassbender, entry fee
361.	Dally & Trelor, entry fee
362.	Racine Sattley Co., entry fee
363.	Helen A. Siegfried, entry fee

No.	From whom and for what.	Amount
364.	The Baker Mfg. Co., entry fee	2 00
365.	American Ditching Co., entry fee	2 00
366.	Clara Mueller, entry fee	2 00
367.	Mrs. H. M. Sery, entry fee	2 00
368.	Miss C. J. Smith, entry fee	2 00
369.	Manhattan Belting Works, wagon ticket	4 00
370.	Francis D. Bancroft, entry fee, Dept. E	2 25
371.	Mrs. William Binger, entry fee	2 00
372.	B. F. Langland, entry fee	2 00
373.	Mrs. Martin Dreyfus, entry fee	2 00
374.	Mrs. A. W. Kuhn, entry fee	2 00
375.	Stoughton Wagon Co., entry fee	2 00
376.	Mrs. Frank Remlinger, entry fee	2 00
377.	Alvin Frantz, entry fee	2 00
378.	Alvin Frantz, coop rent	2 50
379.	Al Kroeger, entry fee	2 00
380.	W. J. Feind, entry fee	2 00
381.	George Illian, entry fee	2 00
382.	W. C. Boldt, entry fee	2 00
383.	Mrs. J. Kornely, entry fee	2 00
384.	Albert Magnus, Jr., entry fee	2 00
385.	Mrs. W. W. Paine, entry fee	2 00
386.	Toole Bros., entry fee	2 00
387.	F. A. Bremer, entry fee	2 00
388.	R. A. Garlick, entry fee	2 00
389.	Will Conway, entry fee	2 00
390.	Oscar Buxbaum, entry fee, Dept. E	2 85
391.	Thomas B. McCauley, entry fee, Dept. E	2 50
392.	Louis Falck, entry fee	2 00
393.	Mrs. A. W. Lehman & Son, entry fee	2 00
394.	William H. Augstein, entry fee	2 00
395.	F. A. Flynn, entry fee	2 00
396.	L. P. Holgerson, entry fee	2 00
397.	Philip Becker, entry fee	2 00
398.	Harry Marks, entry fee	2 00
399.	Mrs. W. E. Langenberg, entry fee	2 00
400.	A. L. White, entry fee	2 00
401.	Mrs. M. Casperson, entry fee	2 00
402.	William White, entry fee	2 00
403.	August Pollworth, entry fee	2 00
404.	Geo. C. Philippi, pen rent	1 00
405.	————————	5 00
406.	Michigan Wagon & Manufacturing Co., entry fee	2 00
407.	Safety Shredder Co., entry fee	2 00

No.	From whom and for what.
408.	H. R. Brown, entry fee
409.	Parry Mfg. Co., entry fee
410.	Chandler Bros., entry fee
411.	Harriette Evans, entry fee
412.	Frank J. Lindley, entry fee
413.	Mrs. Ethel Nelson, entry fee
414.	Spring Brook Stock Farm, entry and pen rent
415.	Fountain City Poultry Yards, entry fee, Dept.
416.	Rosenthal Corn Husker Co., entry fee
417.	Wadhams Oil Co., tickets
418.	Paul Gerhard & Son, entry fee
419.	O. F. Roessler, privileges
420.	J. J. Mueller, wagon ticket
421.	Durant-Dort Carriage Co., entry fee
422.	The Thomas Mfg. Co., entry fee
423.	Rock Island Plow Co., entry fee
424.	H. C. Schmitt, entry fee, Dept. E
425.	F. L. Schmidt & Son, entry fee
426.	Western Electric Co., entry fee
427.	P. P. Mast & Co., entry fee
428.	Mrs. J. W. Cutler, entry fee
429.	Dain Mfg. Co., entry fee
430.	Hoosier Drill Co., entry fee
431.	Ralph A. Pilgrim, entry fee
432.	Wm. F. Pilgrim, entry fee
433.	Milwaukee Hay Tool Co., entry fee
434.	Minneapolis Silo Co., entry fee
435.	Louis Klein, entry fee
436.	Fairbanks-Morse Co., entry fee
437.	Fred Vogel, Jr., stall rent
438.	Geo. J. Jeffery, entry fee
439.	De Laval Separator Co., entry fee
440.	Adrian Wire Fence Co., entry fee
441.	Fred Gruenwald, entry fee
442.	Mrs. Mary W. Place, entry fee
443.	Mrs. Chas. H. Wood, entry fee
444.	Eliza J. Stacks, entry fee
445.	John M. Dunlop, entry fee
446.	Pittsburg Steel Co., entry fee
447.	R. A. Sheldon, entry fee
448.	Mrs. R. B. Dobrogowski, entry and coop rent,
449.	R. B. Dobrogowski, entry and coop rent, E
450.	Brown-Friend Co., entry fee
451.	F. H. Williamsen, entry fee

No.	From whom and for what.	Amount
452.	C. Williamsen, entry fee, Dept. E	3 75
453.	T. Williamsen, entry fee, Dept. E	2 25
454.	H. W. Koerner, entry fee	2 00
455.	Velie Carriage Co., entry fee	2 00
456.	Mrs. P. M. Kynaston, entry fee	2 00
457.	H. C. Taylor, entry and pen rent	5 00
458.	William G. Lueps & Son, entry fee	2 00
459.	R. L. Bollman, entry and pen rent	7 00
460.	Mrs. Anna L. Corwith, entry fee	2 00
461.	A. B. Hoyt, entry fee	2 00
462.	Dawson Bros., entry fee, Dept. E	14 00
463.	F. H. Williamsen, coop rent	2 50
464.	John Conrad, entry fee, Dept. E	3 50
465.	Herman Kretschmer, entry fee, Dept. E	3 25
466.	O. F. Roessler, privileges	161 00
467.	Humbert & White, entry fee	2 00
468.	B. F. Davidson, entry and pen rent	6 50
469.	Gust Schreiber, entry fee	2 00
470.	A. H. Trentlage & Son, entry fee	2 00
471.	Mrs. Neil McFayden, entry fee	2 00
472.	Otto Olson, entry fee	2 00
473.	Louis Pierron Co., entry fee, Dept. E	8 30
474.	Joseph Holum, wagon ticket	4 00
475.	Mrs. Adda F. Howie, coop rent, Dept. E	5 45
476.	F. P. Bishop, pen rent	3 50
477.	Dowagiac Mfg. Co., entry fee	2 00
478.	Lauritz Olson, entry fee	2 00
479.	Kellogg & Schultz Co., entry fee	2 00
480.	Louden Machinery Co., entry fee	2 00
481.	Mrs. Chas. Nahrath, entry fee	2 00
482.	Henry Wallschlaeger, entry fee, Dept. E	4 00
483.	Joe DeGellecke, entry fee, Dept. E	4 00
484.	John Mitchell, entry fee	2 00
485.	A. Glenn, entry and pen rent	3 00
486.	Chas. M. Dedricks, entry fee, Dept. E	2 30
487.	G. R. Schubert, entry fee, Dept. E	6 00
488.	Mary Hart, entry fee	2 00
489.	J. F. Roe, entry and coop rent	5 25
490.	Chas. Christensen, entry fee, Dept. E	2 30
491.	S. A. Brown & Son, entry fee	2 00
492.	Walter O. Bahr, entry fee, Dept. E	3 50
493.	Harry Twinem, entry fee	2 00
494.	Geo. McKerrow & Sons, entry fee	2 00
495.	Mrs. H. W. Haskell, entry fee	2 00

No.	From whom and for what.
496.	One Minute Mfg. Co., entry fee ....
497.	O. F. Roessler, privileges ....
498.	Mrs. F. Mickelson, entry fee ....
499.	Christensen Engineering Co., entry fee ......
500.	Mrs. A. H. Bartz, entry fee ....
501.	Mrs. E. W. Fry, entry fee ....
502.	H. Bartels, wagon ticket ....
563.	Mrs. Minnie McNitt, entry fee ....
504.	Ida Waecker, entry fee ....
505.	C. H. Hesse, wagon ticket ....
506.	Staver Mfg. Co., entry fee ....
507.	Walter J. Wittich, entry fee ....
508.	Walter Funk, entry fee ....
509.	Mrs. Henry Geisler, entry fee ....
510.	Cream City Mushroom Co., entry ....
511.	Mrs. J. M. Hommel, entry fee ....
512.	Appleton Mfg. Co., entry fee ....
513.	Mrs. Chas. Meyer, entry fee ....
514.	Hirsch Mfg. Co., entry fee ....
515.	Champion Potato Machine Co., entry fee ....
516.	Deere & Co., entry fee ....
517.	Deere & Mansur Co., entry fee ....
518.	Harriett E. Zaun, entry fee ....
519.	Mrs. Mary Tindall, entry fee ....
520.	Mitchell Carrier Mfg. Co., entry fee ....
521.	Lutter & Jacobi Co., entry fee ....
522.	Robinson Spreader Co., entry fee ....
523.	Alma Bigelaar, entry fee ....
524.	Chas. A. Haney, entry fee ....
525.	W. W. Brisk, entry fee ....
526.	C. Tochterman, pen rent ....
527.	O. E. Price, wagon ticket ....
528.	J. R. Love, coop rent ....
529.	Addison Love, entry fee ....
530.	Eugenie Schoen, entry fee ....
531.	Edna Stoppenbach, entry fee ....
532.	Bateman Mfg. Co., entry fee ....
533.	Curtis Auto Co., entry fee ....
534.	Marion E. Keogh, entry fee ....
535.	Henry J. Schuette, entry fee ....
536.	Henry Wallschlaeger, coop rent ....
537.	A. D. Currie, entry fee ....
537a.	Mrs. C. C. Barrett, entry fee ....
538.	Philip H. Koenig, entry fee ....

No.	From whom and for what.	Amount
539.	M. Johnson, entry fee	2 00
540.	Mrs. E. W. Karrer, entry fee	2 00
540a.	A. A. Mueller, entry fee	2 00
541.	John Beemster, entry fee	2 00
542.	W. C. Ganschow, entry fee	2 00
543.	William Engelland, entry fee	2 00
544.	Drew Elevated Carrier Co., entry fee	2 00
545.	Chas. Besecker, entry fee, Dept. E	4 40
546.	Moline Wagon Co., entry fee	2 00
547.	William Korb, entry fee, Dept. E	4 70
548.	C. J. Poulter, entry and pen rent	4 00
549.	Kent Mfg. Co., entry fee	2 00
550.	Knoerrschild & Dierkmeier, entry fee	2 00
551.	Gust Skebek, wagon ticket	5 00
552.	The J. B. Ford Co., entry fee	2 00
553.	Fuller & Johnson Mfg. Co., entry fee	2 00
554.	R. W. Boerner, entry fee	2 00
555.	A. W. Zimmerman, entry fee	2 00
556.	Adjustable Steel Centering Co., entry fee	2 00
557.	Nichols-Shepard Co., entry fee	2 00
558.	J. B. Atwood & Son, entry and pen rent	6 00
559.	Joseph Volz, entry fee	2 00
560.	C. E. Judson, entry fee	2 00
561.	W. E. Palmer, coop rent	30
562.	E. D. Ochsner, entry fees	4 00
563.	Orpington View Poultry Yards, entry fee	2 00
564.	F. E. Boots, entry fee	2 00
565.	J. C. Mason, entry fee	2 00
566.	Walter W. Rugowski, entry fee	2 00
567.	Vernon Kinney, entry fee	2 00
568.	International Salt Co., entry fee	2 00
569.	Armand R. Tibbits, entry fee	2 00
570.	Standard Iron & Wire Works, entry fee	2 00
572.	Mrs. Anna E. Pierce, entry fee	2 00
573.	Frederick Heckman, entry fee	2 00
574.	Mrs. James E. Rogers, entry fee	2 00
575.	Mrs. C. D. Boettcher, entry fee	2 00
576.	The Larson-Lawton Co., entry fee	2 00
577.	Davenport Wagon Co., entry fee	2 00
578.	La Porte Carriage Co., entry fee	2 00
579.	C. M. Gullickson Mfg. Co., entry fee	2 00
580.	Mrs. E. Paglow, entry fee	2 00
581.	Arthur J. Segall, entry fee	2 00
582.	F. W. Penny Boat Co., entry fee	2 00

No.	From whom and for what.
583.	Mrs. J. C. Thomson, entry fee
584.	John Kazolka, entry fee
585.	Milwaukee Steel Post Co., entry fee
586.	Standard Separator Co., entry fee
587.	James G. Boyd, stall rent
588.	Henry Tesarick, entry fee
589.	Buffalo Pitts Co., entry fee
590.	Franklin Lyons, entry fee
591.	The Russell Co., entry fee
592.	Mrs. F. Wakefield, entry fee
593.	Void.
594.	A. A. White, entry fee
595.	Dougherty Cement Post Co., entry fee
596.	A. B. Weniger, entry fee
597.	Katie Bodden, entry fee
598.	A. M. Schulz, entry fee
599.	A. J. Sawyer, entry fee
600.	E. J. Seyferth, entry fee
601.	Barrett Mfg. Co., entry fee
602.	Hunkel's Seed Store, entry fee
603.	E. E. Hammond, entry fee
604.	H. Groh, wagon ticket
605.	Alma A. Wolff, entry fee
606.	E. D. Jones & Son, entry and stall rent
607.	Geo. Diesch, entry fee
608.	The Beal Grain Saver Mfg. Co., entry fee
609.	Sandwich Mfg. Co., entry fee
610.	Void.
611.	International Harvester Co., entry fee
612.	Morgan Concrete Block Co., entry fee
613.	Mathilda G. Schley, entry fee
614.	A. E. Johnson, entry fee
615.	Clarence H. Boettcher, entry fee
616.	Mrs. L. Yanke, entry fee
617.	Olds Gas & Power Co., entry fee
618.	Ferd Vanselow, entry fee, Dept. E
619.	Herman Vanselow, entry fee, Dept. E
620.	John Graf, wagon ticket
621.	South Bend Chilled Plow Co., entry fee
622.	Skiles Bakery Co., wagon ticket
623.	E. L. Douville, wagon ticket
624.	M. Rumely Co., entry fee
625.	Janesville Machine Co., entry fee
626.	Smith Mfg. Co., entry fee

No.	From whom and for what.	Amount
627.	Black Mfg. Co., entry fee	2 00
628.	J. C. Wetherby, entry fee	2 00
629.	Johnson Mfg. Co., entry fee	2 00
630.	The Van Brunt Mfg. Co., entry fee	2 00
631.	R. J. Schwab & Son, entry fee	2 00
632.	Adler Ice Cream Co., wagon ticket	5 00
633.	Aug. C. Neess, entry fee	2 00
634.	Otto Thanner, entry fee, Dept. E	3 15
635.	Miss M. Riordan, entry fee	2 00
636.	Adelaide O'Keefe, entry fee	2 00
637.	Peter Dennison, entry fee	2 00
638.	Thomas Hoffman, entry fee	2 00
639.	Allister Currie, entry fee	2 00
640.	Mrs. E. Reuter, entry fee	2 40
641.	Theo. Reuter, entry fee, Dept. E	3 50
642.	Anna C. Ludwig, entry fee	2 00
643.	Chamberlain Machine Co., entry fee	2 00
644.	Geo. J. Ross, entry fee	2 00
645.	Staver Carriage Co., entry fee	2 00
646.	John Dorsch & Co., entry fee	2 00
647.	Dailey & Beanton, entry fee	2 00
648.	Clara Miller, entry fee	2 00
649.	Mrs. Robert Wendland, entry fee	2 00
650.	Mrs. F. E. Elliott, entry fee	2 00
651.	Empire Cream Separator Co., entry fee	2 00
652.	William V. George, entry fee	2 00
653.	S. B. Friday, entry fee	2 00
654.	Raleigh Falbe, entry fee	2 00
655.	La Crosse Plow Co., entry fee	2 00
656.	Peter Elmer, Jr., entry fee	2 00
657.	J. I. Case Plow Co., entry fee	2 00
658.	Standard Iron Works, entry fee	2 00
659.	H. E. Krueger, entry fee	2 00
660.	Mrs. A. I. Clapp, entry fee	2 00
661.	Theo. Koss, entry fee	2 00
662.	Mrs. Addie M. Witte, entry fee	2 00
663.	Geo. Fitx Henry, entry fee	2 00
664.	Geo. W. Tulenz, entry fee, Dept. E	2 50
665.	Wisconsin Culvert Co., entry fee	2 00
666.	Mrs. F. McAneney, entry fee	2 00
667.	Hartel Bischof, entry fee	2 00
668.	James F. Gaffney, entry fee	2 00
669.	Mrs. B. Hermen, entry fee	2 00
670.	Mrs. Adele Chase, entry fee	2 00
671.	Alice G. Glovinske, entry fee	2 00

No.	From whom and for what.
672.	Althouse-Wheeler Co., entry fee ....
673.	John Lauson Mfg. Co., entry fee ....
674.	Mrs. John J. Hannan, entry fee ....
675.	Klose & Ueberall, entry fee ....
676.	Ernst Stolp Co., entry fee ....
677.	Sharpless Separator Co., entry fee ....
678.	Boerth & Porth Co., entry fee ....
679.	Mrs. Julia Jahnke, entry fee ....
680.	Wisconsin Carriage Co., entry fee ....
681.	Mrs. Peter Wolf, entry fee ....
682.	Mrs. I. N. Betten, entry fee ....
683.	Bernard C. Roloff, entry fee ....
684.	J. F. Dabareiner, entry fee ....
685.	F. Stier, entry fee, Dept. E......................
686.	A. M. Johnson, entry fee ....
687.	Boots & Stier, entry fee ....
688.	Grace H. Martin, entry fee ....
689.	Claude Tyrell, entry fee ....
690.	Theo. Gerlach, entry fee ....
691.	Hirsch Bros., entry fee ....
692.	L. L. Allen & Co., entry fee ....
693.	L. M. Duncan, entry fee ....
694.	Francis Bridler, entry fee ....
695.	H. W. Melchert, entry fee ....
696.	A. M. Fiebrantz, entry fee ....
697.	Walter E. Holmes, entry fee ....
698.	Jacob Marty, entry fee ....
699.	Mrs. F. O. Eastman, entry fee ....
700.	D. M. Sechler Carriage Co., entry fee ....
701.	O. F. Roessler, privileges ....
702.	A. O. Fillbach, entry fee ....
703.	J. J. Rodig, entry fee ....
704.	O. P. Olson, entry fee ....
705.	Pasbrig Bros., entry fee, Dept. E...............
706.	M. Pasbrig, entry fee, Dept. E..................
707.	G. Busalchi, entry fee ....
708.	Herman Ziemer, entry fee ....
709.	Smith-Blodgett Co., wagon ticket ....
710.	C. G. Wilcox, speed department, collections ....
711.	J. H. Gevaart, wagon ticket ....
712.	E. G. Kemper, entry fee ....
713.	Chas. Budoski, wagon ticket ....
714.	Chas. T. Hill, entry fee ....
715.	A. F. Groelle, entry fee ....

No.	From whom and for what.	Amount
16.	The Sanitary Market Co., wagon ticket	5 00
717.	William Ehlke, entry fee	2 00
18.	Monitor Drill Co., entry fee	2 00
19.	E. W. Ripley, entry fee	2 00
20.	John M. True, transportation licenses	70 00
21.	J. G. Walvoord, entry and coop rent	2 55
22.	Stiles & Zahr, entry fee	2 00
23.	F. Sette, entry fee	2 00
24.	Henry Strobach, entry fee	2 00
25.	J. I. Case Threshing Machine Co., entry fee	2 00
26.	West Malleable Iron Mfg. Co., entry fee	2 00
27.	R. J. Strassberger, wagon ticket	4 00
28.	Cyclone Fence Co., entry fee	2 00
29.	Pello Stacker Co., entry fee	2 00
30.	Julius Andrae & Sons Co., entry fee	2 00
31.	Collins Plow Co., entry fee	2 00
32.	William Hacker, wagon ticket	5 00
33.	Wagner & Gores Delivery, wagon ticket	5 00
34.	E. W. Clash Co., entry fee	2 00
35.	Middleton Machine Co., entry fee	2 00
36.	F. Simonet, wagon ticket	5 00
37.	Lennox Torrid Zone Furnace Co., entry fee	2 00
38.	G. F. Groth, wagon ticket	5 00
39.	Layton Bros., wagon ticket	4 00
40.	A. R. Netz, wagon ticket	4 00
41.	Manlove Gate Co., entry fee	2 00
42.	W. F. & L. S. Reppert, entry fee	2 00
43.	Deere & Co., entry fee	2 00
44.	Mansur Co., entry fee	2 00
45.	Smaley Mfg. Co., entry fee	2 00
46.	Alma Mfg. Co., entry fee	2 00
47.	Mrs. R. C. Smith, entry fee	2 00
48.	Mrs. P. DeBruine, entry fee	2 00
49.	Mrs. Jos. Hart, entry fee	2 00
50.	Mrs. B. F. Yost, entry fee	2 00
51.	Power Vehicle Co., entry fee	2 00
52.	E. L. Husting, wagon ticket	5 00
53.	Diets & Co., entry fee	2 00
54.	Tom Dwyer, wagon ticket	4 00
55.	C. F. Nollis, wagon ticket	5 00
56.	Farmers' Handy Wagon Co., entry fee	2 00
57.	Wisconsin Coal Co., entry fee	2 00
58.	C. G. Wilcox, Speed Department, collections	391 00
59.	C. T. Fisher, Forage Department, collections	100 00

No.	From whom and for what.
760.	O. F. Roessler, privileges
761.	Taylor & Jones, entry fee
762.	Branch Mfg. Co., entry fee
763.	Acme Pattern Mfg. Co., entry fee
764.	H. P. West, entry and pen rent
765.	L. Wirth & Son, wagon ticket
766.	Alex Galbraith & Son, entry fee
767.	L. Wilbur Co., wagon tickets
768.	R. A. Sullivan, wagon ticket
769.	E. G. Roberts, entry and coop rent
770.	A. Selle, entry fee
771.	C. S. Hechtner, entry and stall rent
772.	O. V. Battles, entry and stall rent
773.	J. E. Burton, entry fee
774.	John T. Edwards, stall rent
775.	Louis Roberts, stall rent
776.	Uriah Cook & Son, pen rent
777.	Chandler Bros., pen rent
778.	A. N. Kelly, pen rent
779.	Sam Jones & Son, stall rent
780.	Herr Bros. & Reynolds, entry fee
781.	F. S. Bunker, stall rent
782.	Anton Kettelman, entry fee
783.	Stoughton Cement Machine Co., entry fee
784.	A. W. Arnold, entry fee
785.	Balmat & Son, entry and pen rent
786.	Humbert & White, pen rent
787.	Philip Koch, entry fee
788.	John Luetlow, entry fee
789.	A. H. McIntire, entry fee
790.	O. J. Groth, entry fee
791.	Hal Austin, entry fee
792.	Floyd Tisdale, entry fee
793.	Albert Schauf, entry fee
794.	Geo. A. Small, wagon ticket
795.	Gilson Mfg. Co., entry fee
796.	Cargill & McMillan, entry fee
797.	Dr. David Roberts, stall rent
798.	Dr. David Roberts, entry fees
799.	W. H. Reed, entry and pen rent
800.	Siefert & Son, wagon ticket
801.	L. P. Martiny, entry fee
802.	Edward Amerphol, entry fee
803.	Mrs. Adda F. Howie, collections
804.	E. M. & H. E. Moore, pen rent

No.	From whom and for what.	Amount
805.	O. F. Roessler, privileges	1,042 32
806.	C. G. Wilcox, Speed Department, collections	1,050 00
807.	Frank J. Clouss, entry fee	2 00
808.	Joseph Holub, wagon helper's ticket	1 00
809.	J. R. Love, stall rent	2 00
810.	Trachte Bros. & Co., entry fee	2 00
811.	William Melrose, entry fee	2 00
812.	McLay Bros., stall rent	33 00
813.	Henry Tennessen, stall rent	11 00
814.	Olson & Richardson, entry fee	2 00
815.	Alex Stewart Lumber Co., stall rent	14 00
816.	W. A. McHenry, stall rent	14 00
817.	Lewis Bros., entry and pen rent	9 50
818.	The Wasson Stanchion Co., entry fee	2 00
819.	H. Bartels, wagon helper's ticket	1 00
820.	C. D. Bergen, entry fee	2 00
821.	L. M. Duncan, pen rent	50
822.	William Rowan, withdrawal speed	150 00
823.	Ohio Rake Co., entry fee	2 00
824.	W. G. Bartholf, pen rent	7 50
825.	J. H. Green, balance stall rent	1 00
826.	J. H. Green, entry and stall rent	4 00
827.	Gate receipts	2,290 00
828.	N. M. Jewell & Sons, pen rent	1 00
829.	Geo. G. Cox, grand stand receipts	636 00
830.	McCullough Mfg. Co., entry fee	2 00
831.	F. H. Patten, pen rent	5 00
832.	Heck Bros., pen rent	3 00
833.	C. T. Fisher, Forage Department, collections	150 00
834.	Adolph P. Arp, stall rent	18 00
835.	O. F. Roessler, privileges	1,201 50
836.	Worcester Salt Co., entry fee	2 00
837.	C. G. Wilcox, Speed Department, collections	335 00
838.	Geo. Ineichen & Son, stall rent	12 50
839.	A. R. Ives, stall rent	28 00
840.	Frank J. Clouss, stall rent	12 00
841.	W. W. Vaughn & Son, pen rent	7 00
842.	Wilbur Lumber Co., wagon ticket	4 00
843.	Taylor & Jones, stall rent	26 00
844.	Power Vehicle Co., tickets	2 50
845.	Drew Mfg. Co., entry fee	2 00
846.	Gate receipts	1,038 50
847.	Adam Seitz, stall rent	16 00
848.	Globe Mfg. Co., entry fee	2 00
849.	O. F. Roessler, privileges	432 95

No.	From whom and for what.
850.	Chas. T. Hill, pen rent
851.	T. S. Simpson, stall rent
852.	Grube-Herman Stanchion Co., entry fee
853.	Twentieth Century Roofing Co., entry fee
854.	C. Blumer, wagon ticket
855.	Oshkosh Logging Tool Co., entry fee
856.	La Grange Specialty Co., entry fee
857.	National Gas Light Co., entry fee
858.	Gate receipts
859.	John B. Irwin, entry fee
860.	Carter, Chapman & Co., entry fee
861.	Witte & Land, stall rent
862.	O. F. Roessler, privileges
863.	C. G. Wilcox, Speed Department, collection
864.	Geo. G Cox, grand stand receipts
865.	Gate receipts
866.	C. T. Fisher, Forage Department, collection
867.	W. Woodard, pen rent
868.	Scott Deaner, stall rent
869.	William M. Jones, stall rent
870.	O. F. Roessler, privileges
871.	Geo. G. Cox, grand stand receipts
872.	Gate receipts
873.	Gate receipts
874.	C. G. Wilcox, Speed Department, collection
875.	Geo. G. Cox, grand stand receipts
876.	Geo. G. Cox, grand stand receipts
877.	Gate receipts
878.	Geo. G. Cox, grand stand receipts
879.	Geo. G. Cox, grand stand receipts
880.	Geo. G. Cox, grand stand receipts
881.	F. L. Clemons, returned change
882.	Gate receipts
883.	C. T. Fisher, Forage Department, collectio
884.	Geo. G. Cox, grand stand receipts
885.	O. F. Roessler, privileges
886.	Geo. G. Cox, grand stand receipts
887.	O. F. Roessler, privileges
888.	C. G. Wilcox, Speed Department, collections
889.	Gate receipts
890.	Gate receipts
891.	Geo. G. Cox, grand stand receipts
892.	Geo. G. Cox, grand stand receipts
893.	C. T. Fisher, Forage Department, collection
894.	Geo. G. Cox, grand stand receipts

No.	From whom and for what.	Amount
895.	Geo. G. Cox, grand stand receipts	475 00
896.	John Early, withdrawal speed	150 00
897.	Gate receipts	10,777 00
898.	Geo. G. Cox, grand stand receipts	483 00
899.	O. E. Roessler, privileges	514 60
900.	F. L. Clemons, returned change	1,000 00
901.	Gate receipts	1,800 00
902.	R. E. Roberts, Wis. P. C. Breeders' Special	98 50
903.	C. L. Hill, meal tickets for asst. supt	1 25
904.	John M. True, sale of catalogues	7 70
905.	O. F. Roessler, privileges	899 25
906.	Fox & Gallagher, stall rent	6 00
907.	Kroeger Bros., sale of tickets	40 00
908.	Geo. G. Cox, grand stand receipts	612 75
909.	O. F. Roessler, privileges	298 00
910.	O. F. Roessler, privileges	134 00
911.	Geo. G. Cox, grand stand receipts	1,889 50
912.	O. F. Roessler, privileges	320 00
913.	C. T. Fisher, Forage Department, collections	170 00
914.	Gate receipts	2,000 00
915.	Gate receipts	1,145 00
916.	W. H. Reed, Wis. Swine Breeders' Asso. Special	35 00
917.	C. T. Fisher, Forage Department, collections	145 20
918.	Balmat & Son, balance pen rent	1 00
919.	C. G. Wilcox, Speed Department, collections	800 00
919a.	C. T. Fisher, Forage Department, collections	44 00
920.	Finch Bros., stall rent	44 00
921.	O. F. Roessler, privileges	1,167 77
922.	E. R. Thomas & Son, stall rent	10 00
923.	E. O. Best, meal tickets, collected	206 25
924.	O. F. Roesscler, privileges	100 50
925.	Gate receipts	2,504 75
926.	Gate receipts	1,844 30
927.	Geo. G. Cox, grand stand receipts	822 25
928.	Gate receipts	951 75
929.	Geo. G. Cox, grand stand receipts	300 00
930.	Mrs. Norah E. R. Perkins, receipts, Rest Building	96 30
931.	O. F. Roessler, privileges	464 55
932.	Mrs. Adda F. Howie, collections	9 91
933.	Mrs. Adda F. Howie, collections	2 50
934.	C. T. Fisher, Forage Department, collections	266 42
935.	Geo. G. Cox, grand stand receipts	62 00
936.	C. G. Wilcox, Speed Department, collections	736 00
937.	Meal tickets	6 25

No.	From whom and for what.
938.	C. L. Hill, Sec. Western Guernsey Br. Ass
939.	Modern Steel Structural Co., tickets........
940.	G. J. Thomas, speed entry..................
941.	C. A. Niles, speed entry....................
942.	J. W. Flack, speed entry....................
943.	I. Seery, suspension speed..................
944.	John Ryan, speed entry......................
945.	Deere & Co., tickets........................
946.	H. C. Taylor, Sec. Berkshire Breeders' Ass
947.	J. L. Wentz, protested check...............
948.	Pain Fireworks Co., refund freight charges.
949.	George Ewald, coop rent E.................
950.	H. B. Stanz Co., sale of cheese.............
951.	A. E. Rundell, overpaid premium returned..
952.	Smith & Keil, sale of butter................
	Total ....

OCTOBER.

No.	From whom and for what.
953.	J. H. Martz, Sec. Polled Durham Breeders'
954.	A. E. Ellickson, returned check............
955.	Gilbert Horton, returned check............
956.	Am. Shorthorn Breeders' Assoc., special....
957.	C. A. Tyler, Hampshire D. B. Assoc., speci
958.	James T. Drought, use of track, auto meet.
959.	Geo. W. Stubblefield, Perch. Soc. of Am., s
960.	Wing, R. Smith, Sec. Holstein-Friesian, spec
961.	S. A. Converse, Sec. Red Polled Assoc., spe
962.	Lindsay Bros., tickets......................
963.	James T. Drought, balance on track rent....
964.	International Harvester Co., tickets.........
965.	C. T. Fisher, Forage Department, collection
966.	James E. Patton, overpayment..............
967.	Milwaukee School Board, use of grounds.....
968.	Wisconsin Telephone Co., state fair privileg
969.	C. R. Thomas, Am. Hereford Breeders' Ass
970.	American Trotting Assoc., collections.......
	Total ....

NOVEMBER.

No.	From whom and for what.
971.	R. B. Ogilvie, Sec. Am. Clydesdale Assoc.,
972.	Frank Kleinheinz, Treas. Wis. Sheep Breeders special ....

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No.	From whom and for what.	Amount
973.	John Pritzlaff Hardware Co., returned payment	57 60
974.	Geo. H. Ketcham, suspension speed	75 00
975.	E. E. Jones, Sec. Wis. Shorthorn, special	64 50
976.	International Stock Food Co., suspension speed	240 00
977.	W. A. Shafor, Sec. Am. Oxford Assoc., special	45 00
978.	Am. Cotswold Assoc., payment on special premium	52 34
	Total	$844 44

DECEMBER.

979.	American Trotting Association	$135 00

JANUARY—1909.

980.	D. B. Danielson, refund discount	$34 50
981.	Wisconsin Horse Breeders' Assoc., special	527 00
982.	Returned drafts	3 50
983.	Sale of butter and cheese	9 48
	Total	$574 48
	Miscellaneous receipts	5 43
	Amount of appropriation received from state	8,097 04
	Total	$98,770 73

SECRETARY'S WARRANT A

1908—MARCH.

No.	To whom paid.
1.	Ed Nordman, expenses
2.	C. H. Everett, expenses
3.	C. L. Hill, expenses
4.	C. G. Wilcox, expenses
5.	Geo. G. Cox, expenses
6.	J. L. Herbst, expenses
7.	Geo. McKerrow, expenses
8.	Mrs. A. L. Kelly, stenographic report
9.	Democrat Printing Co., subscription
10.	John M. True, payment March salary
11.	O. F. Roessler, expenses
12.	Geo. Wylie, expenses
13.	L. E. Scott, expenses
14.	G. U. Fisher, expenses
15.	John M. True, balance March salary
16.	B. L. Wentworth, salary, March
17.	H. Raymond, wages March
18.	R. B. Watrous, expenses
19.	Am. Shorthorn Breeders' Assoc., herd boo
20.	John M. True, expenses to Milwaukee
21.	Geo. McKerrow, expenses
22.	Geo. Wylie, expenses
23.	Geo. G. Cox, expenses
24.	G. U. Fisher, expenses
25.	Mrs. L. T. Gannon, expenses trip to Mil
	Total

APRIL.

No.	To whom paid.
26.	John M. True, payment April salary
27.	A. LeFeber, feed, etc
28.	R. B. Ogilvie, Sec., payment on cups
29.	Geo. McKerrow, expenses

No.	To whom paid.	Amount
30.	Geo. Wylie, expenses	6 57
31.	G. U. Fisher, expenses	4 83
32.	Geo. G. Cox, expenses	13 10
33.	John M. True, expenses	5 36
34.	Star Laundry Co., laundry '07	9 04
35.	Ferry & Clas, payment for service '07	150 00
36.	H. A. Sonnabend, sales J '07 Fair	2 00
37.	C., M. & St. P., Ry. Co., freight '07	10 48
38.	H. Raymond, wages April	50 00
39.	B. L. Wentworth, salary April	60 00
40.	John M. True, balance April salary	150 00
41.	John M. True, expenses to Milwaukee	4 96
42.	Geo. G. Cox, expenses	11 15
43.	Geo. Wylie, expenses	5 66
44.	G. U. Fisher, expenses	4 58
45.	Geo. McKerrow, expenses	4 94
46.	James J. Nelson, expenses	68 15
47.	A. LeFeber, feed, etc	57 80
48.	A. P. St. John, typewriter repairs	1 75
49.	Sports of the Times, advertising speed	38 75
50.	Chicago Horseman, advertising speed	61 60
51.	New York Clipper, advertising speed	41 00
52.	O. F. Roessler, expenses	12 12
	Total	$859 59

MAY.

No.	To whom paid.	Amount
53.	American Trotting Assoc., annual dues and year book	$103 50
54.	Lindsay Bros., machinery	16 75
55.	A. LeFeber, feed, etc	10 39
56.	Kentucky Stock Farm, advertising speed	13 30
57.	Horse Review Co., advertising speed	58 84
58.	Am. Horse Breeder, advertising speed	64 20
59.	John M. True, expenses to Milwaukee	4 86
60.	Geo. Wylie, expenses	6 35
61.	Geo. G. Cox, expenses	11 30
62.	G. U. Fisher, expenses	6 13
63.	Geo. McKerrow, expenses	2 92
64.	Chas. Miller, labor	30 00
65.	Thos. Skinner, labor	14 00
66.	Wm. Stone, labor	15 60
67.	C. A. Brown, labor	5 00
68.	Wis. Telephone Co., messages	1 55
69.	Rockford Tack & Nail Co., bill posters' tacks	17 26

No.	To whom paid.
70.	The Horse World, advertising speed
71.	Smith-Blodgett Co., mdse
72.	West Allis Lumber Co., lumber
73.	Geo. Wylie, expenses
74.	J. L. Herbst, expenses
75.	C. H. Everett, expenses
76.	Geo. McKerrow, expenses
77.	L. E. Scott, expenses
78.	Geo. G. Cox, expenses
79.	John M. True, expenses
80.	Chas. Miller, labor
81.	Geo. De Bruine, labor
82.	Thos. Skinner, labor
83.	Carl Haupt, labor
84.	Chas. Rapp, labor
85.	Otto Barnekow, labor
86.	Herman Jaeger, labor
87.	Carl Gleisner, labor
88.	J. Wiswell, labor
89.	Wm. Stone, labor
90.	Louis Elgas, labor
91.	C. A. Brown, labor
92.	B. Miller, labor
93.	H. Raymond, wages May
94.	B. L. Wentworth, salary May
95.	John M. True, salary May
	Total

JUNE.

No.	To whom paid.
96.	G. U. Fisher, expenses
97.	Geo. G. Cox, expenses
98.	Geo. Wylie, expenses
99.	John M. True, expenses
100.	Chas. Miller, labor
101.	Geo. De Bruine, labor
102.	Thos. Skinner, labor
103.	Carl Haupt, labor
104.	Chas. Rapp, labor
105.	Herman Jaeger, labor
106.	Carl Gleisner, labor
107.	Louis Elgas, labor
108.	A. Brown, labor
109.	Walter Baumgarth, labor

No.	To whom paid.	Amount
110.	John Prestin, labor	12 25
111.	B. Miller, labor	2 25
112.	Otto Barnekow, labor	3 50
113.	William Stone, labor	13 50
	For advertising:	
114.	Appleton Post	15 00
115.	Eau Claire Leader	15 00
116.	Eau Claire Telegram	15 00
117.	Fond du Lac Commonwealth	15 00
118.	Fond du Lac Reporter	15 00
119.	Jefferson County Union	15 00
120.	Janesville Gazette	15 00
121.	Jefferson Banner	15 00
122.	Madison Democrat	15 00
123.	Wisconsin State Journal	15 00
124.	Marinette Eagle-Star	15 00
125.	Oshkosh North Western	15 00
126.	Racine News	15 00
127.	Racine Times	15 00
128.	Racine Journal	15 00
129.	Superior Telegram	15 00
130.	Whitewater Register	15 00
131.	Beloit Free Press	10 00
132.	Beloit News	10 00
133.	Berlin Journal	10 00
134.	Chippewa Falls Herald	10 00
135.	Chippewa Falls Times	10 00
136.	Chilton Times	10 00
137.	Delavan Republican	10 00
138.	De Pere Democrat	10 00
139.	De Pere News	10 00
140.	Elkhorn Independent	10 00
141.	Fond du Lac Bulletin	10 00
142.	Green Bay Gazette	10 00
143.	La Crosse Chronicle	10 00
144.	Sheboygan Herald	10 00
145.	Sheboygan Falls News	10 00
146.	Waukesha Freeman	10 00
147.	Waukesha Dispatch	10 00
148.	Appleton Crescent	5 00
149.	Amherst Advocate	5 00
150.	Ashland Press	5 00
151.	Sauk County Democrat	5 00

No.	To whom paid.
152.	Baraboo News
153.	Baraboo Republic
154.	Beaver Dam Citizen
155.	Beaver Dam Argus
156.	Black River Falls Journal
157.	Black River Falls Banner
158.	Broadhead Independent
159.	Broadhead Register
160.	Burlington Democrat
161.	Burlington Free Press
162.	Boscobel Enterprise
163.	Brillion News
164.	Cambridge News
165.	Cedarburg News
166.	Chilton Democrat
167.	Columbus Republican
168.	Columbus Democrat
169.	Clintonville Tribune
170.	Cuba City News-Herald
171.	Cumberland Advocate
172.	Darlington Journal
173.	Darlington Democrat
174.	Delavan Enterprise
175.	Dodgeville Chronicle
176.	Edgerton Eagle
177.	Wisconsin Tobacco Reporter
178.	Fennimore Times
179.	Fox Lake Representative
180.	Hartford Times
181.	Hartford Press
182.	Horicon Reporter
183.	Janesville Recorder
184.	Juneau Telephone
185.	Kaukauna Times
186.	Kaukauna Sun
187.	Kenosha News
188.	Kenosha Telegraph-Courier
189.	Kenosha Union
190.	Kewaunee Enterprise
191.	Kewaskum Statesman
192.	Kiel Zeitung
193.	Lake Mills Leader
194.	La Crosse Volkspost
195.	La Crosse Tribune

o.	To whom paid.	Amount
96.	Lake Geneva Herald	5 00
97.	Manitowoc Herald	5 00
98.	Manitowoc News	5 00
99.	Manitowoc Pilot	5 00
00.	Manitowoc Post	5 00
01.	Marshfield News	5 00
02.	Marshfield Times	5 00
03.	Mauston Star	5 00
04.	Mayville Pioneer	5 00
05.	Mayville Banner	5 00
06.	Menasha Anzeiger	5 00
07.	Menasha Record	5 00
08.	Menomonie News	5 00
09.	Menomonee Falls News	5 00
10.	Menomonee Falls Sugar Beet	5 00
11.	Milton Junction Telephone	5 00
2.	Monroe Journal-Gazette	5 00
3.	Monroe Sentinel	5 00
4.	Monroe Times	5 00
5.	Neenah Times	5 00
6.	Neenah News	5 00
7.	Oconomowoc Free Press	5 00
8.	Oconomowoc Enterprise	5 00
9.	Oconto Reporter	5 00
0.	Oconto Enterprise	5 00
1.	Palmyra Enterprise	5 00
2.	Platteville News	5 00
3.	Platteville Witness	5 00
4.	Plymouth Reporter	5 00
5.	Port Washington Advertiser	5 00
6.	Plymouth Review	5 00
7.	Portage Democrat	5 00
8.	Portage Register	5 00
9.	Port Washington Star	5 00
0.	Prairie du Chien Courier	5 00
1.	Prairie du Chien Union	5 00
2.	Ripon Press	5 00
3.	Ripon Commonwealth	5 00
4.	Rice Lake Chronotype	5 00
5.	Sheboygan Zeitung	5 00
6.	Sheboygan Telegram	5 00
7.	Sheboygan Journal	5 00
8.	Sheboygan Democrat	5 00
9.	Sheboygan Amerika	5 00

No.	To whom paid.
240.	Stevens Point Gazette
241.	Stevens Point Journal
242.	Sparta Herald
243.	Stoughton Hub
244.	Superior Leader
245.	Tomah Journal
246.	Union Grove Enterprise
247.	Viroqua Censor
248.	Waterford Post
249.	Waterloo Democrat
250.	Watertown Times
251.	Watertown Gazette
252.	Watertown Weltbuerger
253.	Watertown Leader
254.	Wausau Record
255.	Wausau Post
256.	Wausau Republic
257.	Wausau Record
258.	Wausau Central-Wisconsin
259.	Wausau Herald
260.	Waupun Democrat
261.	Waupun Leader
262.	West Bend News
263.	Whitewater Gazette
264.	Albany Vindicator
265.	Athens Record
266.	Algoma Record
267.	Almond Press
268.	Antigo Republican
269.	Augusta Eagle
270.	Augusta Times
271.	Benton Advocate
272.	Belleville Recorder
273.	Bloomington Record
274.	Brandon Times
275.	Bloomer Advance
276.	Blanchardville Blade
277.	Boscobel Sentinel
278.	Berlin Courant
279.	Barron County Shield
280.	Clinton Banner
281.	Cambria News
282.	Crandon Republican
283.	Clinton Herald

o.	To whom paid.	Amount
84.	Dale Recorder	3 00
85.	Dartford Reporter	3 00
86.	Deerfield News	3 00
87.	De Forest Times	3 00
88.	Durand Entering Wedge	3 00
89.	Eagle Quill	3 00
90.	East Troy News	3 00
91.	Elroy Tribune	3 00
92.	Elroy Leader	3 00
93.	Eagle River Review	3 00
94.	Evansville Enterprise	3 00
95.	Evansville Review	3 00
96.	Fort Atkinson Democrat	3 00
97.	Friendship Reporter	3 00
98.	Adams County Press	3 00
9.	Galesville Independent	3 00
00.	Galesville Republican	3 00
01.	Grand Rapids Reporter	3 00
02.	Grand Rapids Tribune	3 00
03.	Wisconsin Valley Leader	3 00
04.	Wood County Reporter	3 00
05.	Grantsburg Journal	3 00
06.	Grantsville Sentinel	3 00
07.	Gratiot Reporter	3 00
08.	Green Bay Review	3 00
9.	Greenwood Gleaner	3 00
0.	Hancock News	3 00
1.	Hartland Times	3 00
2.	Hayward Republican	3 00
3.	Highland Press	3 00
4.	Hollandale Review	3 00
5.	Hillsboro Enterprise	3 00
6.	Hudson Star-Times	3 00
7.	St. Croix Observer	3 00
8.	Hurley Miner	3 00
9.	Iola Herald	3 00
0.	Juneau Independent	3 00
1.	Kenosha Volksfreund	3 00
2.	Kilbourn Mirror-Gazette	3 00
3.	Kingston Spy	3 00
4.	Ladysmith Budget	3 00
5.	Grant County Herald	3 00
6.	Lancaster Teller	3 00
7.	South-West Wisconsin	3 00

No.	To whom paid.
328.	Lodi Enterprise
329.	Loyal Tribune
330.	Manawa Advocate
331.	Marshall Record
332.	Markesan Herald
333.	Marion Advertiser
334.	Mauston Chronicle
335.	Mayville News
336.	Mazomanie Sickle
337.	Medford Waldbote
338.	Merrill News
339.	Merrill Advocate
340.	Middleton Times-Herald
341.	Milton Journal
342.	Mineral Point Tribune
343.	Mineral Point Democrat
344.	Monticello Messenger
345.	Montfort Mail
346.	Mondovi Herald
347.	Montello Express
348.	Morrisonville Tribune
349.	Mt. Horeb Times
350.	Mukwonago Chief
351.	Muscoda Democrat
352.	Necedah Republican
353.	Neillsville Republican
354.	Neillsville Times
355.	Neosho Standard
356.	New Glarus Courier
357.	New Holstein Reporter
358.	New Lisbon Argus
359.	New London Republican
360.	New London Press
361.	Norwalk Star
362.	Oakfield Eagle
363.	Oconto Falls Herald
364.	Omro Herald
365.	Omro Journal
366.	Oregon Observer
367.	Oshkosh Democrat
368.	Osceola Sun
369.	Pardeeville Times
370.	Peshtigo Times
371.	Phillips Times

No.	To whom paid.	Amount
372.	Plainfield Sun	3 00
373.	Platteville Journal	3 00
374.	Portage Rundschau	3 00
375.	Port Washington Zeitung	3 00
376.	Poynette Press	3 00
377.	Sauk County News	3 00
378.	Princeton Republic	3 00
379.	Randolph Advance	3 00
380.	Reedsburg Times	3 00
381.	Reedsburg Free Press	3 00
382.	Reeseville Review	3 00
383.	Rhinelander New North	3 00
384.	Richland Democrat	3 00
385.	Richland Rustic	3 00
386.	Richland Center Republican-Observer	3 00
387.	Rio Reporter	3 00
388.	River Falls Journal	3 00
389.	River Falls Times	3 00
390.	Sauk City Pionier Press	3 00
391.	Seymour Press	3 00
392.	Sharon Reporter	3 00
393.	Shawano Journal	3 00
394.	Shawano Advocate	3 00
395.	Shell Lake Register	3 00
396.	Shiocton News	3 00
397.	Shullsburg Pick and Gad	3 00
398.	Soldiers Grove Journal	3 00
399.	Sparta Democrat	3 00
400.	Spring Green News	3 00
401.	Stanley Republican	3 00
402.	Stoughton Courier	3 00
403.	Sturgeon Bay Advance	3 00
404.	Sun Prairie Countryman	3 00
405.	Sun Prairie News	3 00
406.	Tomah Monitor	3 00
407.	Two Rivers Chronicle	3 00
408.	Viola Intelligencer	3 00
409.	Viroqua Leader	3 00
410.	Walworth Times	3 00
411.	Washburn News	3 00
412.	Wautoma Argus	3 00
413.	Westby Times	3 00
414.	Westfield Central-Union	3 00
415.	West Bend Pilot	3 00

No.	To whom paid.
416.	West Bend Beobachter
417.	Weyauwega Chronicle
418.	Whitehall Times
419.	Wild Rose Times
420.	Wilmot Agitator
421.	Winneconne Local
422.	Wittenberg Enterprise
423.	Wonewoc Reporter
424.	S. D. Kump, advertisement
425.	John Gallagher Co., canvas bags
426.	Mrs. L. T. Gannon, work in office
427.	A. Le Feber, feed
428.	American Sportsman Co., advertising
429.	Fred M. Prescott, S. P. Co., work
430.	R. Polzin, rubber boots
431.	A. Brown, payment on fence work
432.	Geo. Wylie, expenses
433.	G. U. Fisher, expenses
434.	George G. Cox, expenses
435.	John M. True, expenses
436.	O. F. Roessler, expenses
437.	Chas. Miller, labor
438.	Geo. De Bruine
439.	Tom Skinner, labor
440.	Carl Haupt, labor
441.	Chas. Rapp, labor
442.	Herman Jaeger, labor
443.	Carl Gleisner, labor
444.	William Stone, labor
445.	Louis Elgas, labor
446.	A. Brown, labor
447.	John Prestin, labor
448.	W. C. Koontz, labor
449.	William Kramer, labor
450.	Bert Sigrist, labor
451.	Walter Baumgarth, labor
452.	Greve Show Printing Co., adv. material
453.	Am. Trotting Assoc., penalty for suspension
454.	John M. True, trip to Milwaukee
455.	H. Raymond, wages June
456.	B. L. Wentworth, salary June
457.	John M. True, salary June
458.	The Horse World, advertising speed
459.	Chicago Horseman, advertising speed

No.	To whom paid.	Amount
460.	Western Horseman, advertising speed	64 00
461.	Fred Reichenbach, surveyors services	95 42
462	Geo. G. Cox, expenses	11 00
463.	G. U. Fisher, expenses	4 63
464.	George Wylie, expenses	6 89
465.	A. Brown, balance of fence contract	65 00
466.	Chas. Miller, labor	23 60
467.	Geo. De Bruine, labor	47 25
468.	Thos. Skinner, labor	8 40
469.	Carl Haupt, labor	6 65
470.	Chas. Rapp, labor	20 30
471.	Herman Jaeger, labor	19 77
472.	Carl Gleisner, labor	18 90
473.	William Stone, labor	16 35
474.	Louis Elgas, labor	8 10
475.	A. Brown, labor	20 00
476.	John Prestin, labor	18 90
477.	W. C. Koontz, labor	10 32
478.	William Kramer, labor	19 42
479.	James Carlyle, labor	14 87
480.	Adam Huschinger, labor	14 70
481.	F. H. Marvin, labor	12 25
482.	Frank Clark, labor	5 00
483.	Bert Sigrist, labor	3 50
484.	L. S. Learned, labor	3 50
	Total	$3,930 13

JULY.

No.	To whom paid.	Amount
485.	Stark Cabinet Mfg. Co., index cases	$9 15
486.	Adam Huschinger, labor	4 50
487.	John M. True, trip to Milwaukee	5 21
488.	C., M. & St. P. Ry. Co., car of slag	5 00
489.	Smith-Blodgett Co., hardware	73 11
490.	Kentucky Stock Farm, advertising speed	13 30
491.	Horse Review Co., advertising speed	44 13
492.	George Wylie, expenses	6 89
493.	Geo. G. Cox, expenses	11 00
494.	G. U. Fisher, expenses	6 18
495.	Chas. Miller, labor	22 00
496.	Geo. De Bruine, labor	38 65
497.	Chas. Rapp, labor	15 22
498.	Herman Jaeger, labor	15 22
499.	Louis Elgas, labor	29 55

No.	To whom paid.
500.	A. Brown, labor
501.	James Carlyle, labor
502.	F. H. Marvin, labor
503.	William Kenney, labor
504.	Carl Haupt, labor
505.	William Kramer, labor
506.	Dousman Index, advertising
507.	Menomonie Times, advertising
508.	Barneveld Register and Friend, advertising
509.	H. Raymond, wages July
510.	B. L. Wentworth, salary July
511.	John M. True, salary July
512.	John M. True, trip to Milwaukee
513.	George Wylie, expenses
514.	Geo. G. Cox, expenses
515.	O. F. Roessler, expenses
516.	James J. Nelson, expenses
517.	C., M. & St. P. Ry., 10 cars cinders
518.	Wisconsin Telephone Co., services
519.	E. L. Hoffman, advertising
520.	Fred Reichenbach, survey for gutter
521.	C. A. Brown, tools
522.	The Coggshall Co., 50,000 stickers
523.	International Harvester Co., repairs
524.	The Journal Co., advertising privileges
525.	Chas. Miller, labor
526.	Geo. De Bruine, labor
527.	Chas. Rapp, labor
528.	Herman Jaeger, labor
529.	James Carlyle, labor
530.	A. Brown, labor
531.	F. H. Marvin, labor
532.	Minnie Barnekow, labor
533.	William Kenney, labor
534.	The Cramer—Krasselt Co., 3,000 stickers
535.	Fehring Bros., bill posting
	Total

AUGUST.

No.	To whom paid.
536.	John M. True, expenses trip to Milwaukee
537.	D. B. Danielson, wages advanced
538.	Sands Lumber Co., mdse
539.	The Rockwell Mfg. Co., mdse

o.	To whom paid.	Amount
540.	J. C. James, work and mdse.	7 50
541.	F. C. Jirachek, harness repairs	7 45
542.	C., M. & L. S. Tel. Co., messages	12 15
543.	A. Le Feber, grain and feed	65 84
544.	R. B. Watrous, expenses	20 80
545.	Wisconsin Telephone Co., messages	55
546.	Geo. McKerrow, expenses	4 10
547.	G. U. Fisher, expenses	14 48
548.	Geo. G. Cox, expenses	11 40
549.	Chas. Miller, labor	17 00
550.	Geo. De Bruine, labor	39 60
551.	Chas. Rapp, labor	21 60
552.	Herman Jaeger, labor	21 00
553.	A. Brown, labor	20 00
554.	F. H. Marvin, labor	25 37
555.	Minnie Barnekow, labor	13 75
556.	Welcome Meyer, labor	19 25
557.	Ole Matteson, labor	21 87
558.	William Kenney, labor	22 75
559.	John Miller, labor	29 25
560.	Louis Elgas, labor	4 50
561.	John Stone, labor	5 25
562.	Bertha Miller, labor	2 50
563.	Gerry Wolf, labor	13 50
564.	Chas. Barnekow, labor	4 50
565.	Sentinel Co., advertising	98
566.	Smith-Blodgett Co., mdse	84 75
567.	F. D. Fulton, expenses, Springfield	13 50
68.	Free Press Co., advertising	8 00
69.	Geo. G. Cox, expenses	11 85
70.	Geo. Wylie, expenses	17 73
71.	C. L. Hill, expenses	10 78
72.	C. H. Everett, expenses	2 12
73.	L. E. Scott, expenses	13 53
74.	John M. True, expenses trip to Milwaukee	5 46
75.	City of West Allis, water connection	150 00
6.	Mrs. L. T. Gannon, expenses	3 75
7.	John M. True, expenses	5 46
8.	D. B. Danielson, wages advanced	405 84
9.	C., M. & St. P. R. R., freight	106 73
0.	Sands Lumber Co., mdse	68 63
1.	Smith-Blodgett Co., mdse	14 24
2.	O'Neill Oil & Paint Co., mdse	30 78
3.	Kroeger Bros., mdse	10 27

No.	To whom paid.
584.	The Rockwell Mfg. Co., mdse.
585.	John Pritzlaff Hardware Co., mdse.
586.	John W. Heid, roofing barns
587.	Geo. McKerrow, expenses
588.	Geo. Wylie, expenses
589.	Geo. G. Cox, expenses
590.	G. U. Fisher, expenses
591.	Void.
592.	Chas. Miller, labor
593.	Geo. De Bruine, labor
594.	Chas. Rapp, labor
595.	Herman Jaeger, labor
596.	A. Brown, labor
597.	F. H. Marvin, labor
598.	Minnie Barnekow, labor
599.	Welcome Meyer, labor
600.	William Kenney, labor
601.	John Stone, labor
602.	Bertha Miller, labor
603.	Gerry Wolfe, labor
604.	Chas. Barnekow, labor
605.	Fred Theide, labor
606.	E. M. Shaw, labor
607.	F. A. Boisclair, labor
608.	Ole Matteson, labor
609.	John Miller, labor
610.	Otto Kamrath, labor
611.	Dan De Beck, labor
612.	John M. True, salary, August
613.	B. L. Wentworth, salary, August
614.	Sun Republic, advertising
615.	Clark Engraving & Printing Co., ribbons a
616.	The Ansell Ticket Co., roll tickets
617.	J. A. Hawes, bill posting
618.	H. V. Benzie, bill posting
619.	F. E. Shults, bill posting
620.	Chas. C. Miller, bill posting
621.	C. A. Griffith, bill posting
622.	R. E. Werner, bill posting
623.	Laube Bros., bill posting
624.	H. J. Paas, bill posting
625.	Frank Grimmer, bill posting
626.	W. C. Graeber, bill posting
627.	Gust Winkel, bill posting

To whom paid.	Amount
M. L. Smith, bill posting	10 00
Peter Devroy, bill posting	5 75
O. O. Jones, bill posting	1 80
Van Trot Bros., bill posting	5 55
Byron E. Button, bill posting	5 50
Chas. B. Rogers, bill posting	4 80
Henry Carlson, bill posting	17 00
J. B. Arthurs, bill posting	18 75
Geo. W. Schwantes, bill posting	25 00
Lind Bill Posting Co., bill posting	2 00
Myers Posting Service, bill posting	87 75
John D. Lowe, bill posting Co	6 50
Peter Rhode, bill posting	18 75
La Crosse Posting Service, bill posting	4 75
Philip Adler, bill posting	4 40
M. & M. B. P. Co, bill posting	21 00
W. J. Fassbinder & Son, bill posting	2 90
F. Schwenderer, bill posting	5 50
Cream City Bill Posting Co., bill posting	100 00
Geo. A. Bishop, bill posting	3 50
Paul A. Ruf, bill posting	4 00
Fred H. Webb, bill posting	12 00
J. C. Hickey, bill posting	1 80
G. E. Palmer, bill posting	8 00
Frank A. Urwan, bill posting	5 20
J. E. Williams, bill posting	6 25
W. C. Kassebaum, bill posting	1 75
Z. T. Carver, bill posting	1 00
Fred J. Campbell, bill posting	23 00
B. H. Cooley, bill posting	4 75
Aubrey C. King, bill posting	4 00
M. W. Carns, bill posting	5 00
E. J. Kempf, bill posting	85 00
W. L. Bronson, bill posting	3 75
E. C. Chapman, bill posting	8 50
H. Hendrickson, bill posting	5 00
C. G. Brown, bill posting	1 50
Lamere & Hamilton, bill posting	5 25
W. J. Bethke, bill posting	57 50
Tom Pipe, bill posting	4 00
Waukesha, Bill Posting Co., bill posting	10 50
C. A. Cone, bill posting	6 50
Byron H. Cooley, bill posting	4 75
R. J. Murphy, bill posting	75 00

No.	To whom paid.
672.	L. Stang & Sons, bill posting
673.	John Leaver, bill posting
674.	J. A. Hawes, bill posting
675.	H. Raymond, wages, August
676.	J. L. Herbst, expenses
677.	S. A. Pelton, work in office
678.	C. H. Wannamaker, expenses, advertising
679.	Void.
	Total

SEPTEMBER.

No.	To whom paid.
680.	F. L. Clemons, change for gates
631.	Robert Cain, whitewashing
682.	Deere & Co., returned entry
683.	J. S. Conway, speed winnings
684.	The Paine Pyrotechnical Co., payment
685.	Barrett Mfg. Co., returned entry
686.	A. Tullis, speed winnings
687.	C. J. Douglas, speed winnings
688.	J. R. Patton, speed winnings
689.	Frank R. Graham, music, Portage Band
690.	I. L. Sears, speed winnings
691.	S. M. Quaw, overpaid entry
692.	Theo. Sterneman, speed winnings
693.	Pain Pyrotechnic Co., payment
694.	G. N. Mihills, partial payment A
695.	William Plaehn, judging pigeons
696.	Chas. Kerr, judging sheep
697.	F. H. Scribner, assistant supt. B
698.	J. E. Cole, music, Wausau Band
699.	D. T. Heimlich, judging poultry
700.	L. L. Olds, judging farm exhibits
701.	Peter Zumkehr, judging foreign cheese
702.	Jas. Briquelet, speed winnings
703.	O. V. Battles, partial premium B
704.	James Prickett, speed winnings
705.	Geo. C. Hill, judging vegetables
706.	D. J. Fenelon, speed winnings
707.	T. E. Root, speed winnings
703.	William Toole, judging plants and flowers
709.	W. E. Prichard, judging draft horses
710.	Fred Marty, judging foreign cheese
711.	L. O. Turner, refunded suspension speed

To whom paid.	Amount
William Hope, speed winnings	125 00
Pain Pyrotechnic Co., payment	700 00
N. H. Gentry, judging swine	83 00
C. H. Buell, music, Berlin Band	465 00
H. L. Compton, judging sheep	85 00
L. G. Kellogg, judging fruit	24 10
J. B. Irwin, partial premium B	125 00
M. B. Wood, judging dairy cattle	73 36
Frank Wilcox, judging honey	12 05
E. L. Aderhold, judging cheese	8 25
C. F. Curtis, judging draft horses	100 00
Thomas Clark, judging beef cattle	100 00
Pain Pyrotechnic Co., payment	700 00
Pain Pyrotechnic Co., payment in full	100 00
J. H. Dixon, assistant supt. B	24 50
A. W. Knoff, music, Janesville Band	150 00
Katherine Weber, clerk's services	10 50
A. E. Wilson, speed winnings	1,260 00
John M. True, Sec., payment of office force	859 50
Allie Wooster, relay races	2,000 00
Dick McMahon, speed winnings	1,370 00
John M. True, Sec., payment dining room force	207 00
Allie Wooster, running races	350 00
Howard Knowlton, speed winnings	200 00
W. L. Houser, partial premiums A	300 00
I. L. Sears, speed winnings	450 00
William Hope, speed winnings	100 00
S. H. Newman, speed winnings	250 00
H. A. Martin, assistant supt., speed	17 50
William Wolf, hay	93 30
Burton Pheatt, assistant Promotion and Publicity	31 50
Martin Puerner, bill posting	44 00
P. B. Slater, assistant, Publicity and Promotion	24 00
G. Tarbox, announcer	20 00
Christian Hill Stables, speed winnings	950 00
W. C. Rogers, speed winnings	500 00
Mrs. Lida T. Gannon, services department M	146 00
J. M. Bienfang, music, Jefferson Band	379 80
Ethel Robinson, vaudeville acts	2,100 00
Hoyt & Co., premiums in full, E	49 90
E. G. Roberts, partial premium E	150 00
Geo. W. Newton, speed winnings	330 00
Al Coughlin, distributing advertising	78 65
Gus Paseman, speed winnings	150 00

No.	To whom paid.
756.	J. D. Cannon, judging cheese
757.	R. E. Roberts, superintendent C
758.	J. W. Justice, partial premium D
759.	James P. McCullon, partial premium D
760.	C. C. Roup, partial premium D
761.	Geo. E. Kelly, partial premium D
762.	Humbert & White, partial premium D
763.	Geo. Parnell, premium in full C
764.	Chas. Roethel & Son, premium in full D
765.	W. G. Bartholf, partial premium D
766.	James Dillon, superintendent D
767.	H. I. Gibson, assistant superintendent D
768.	Geo. Martin, partial premium D
769.	Geo. Ineichen & Son, partial premium D
770.	Max Chapman, premium in full C
771.	Neal Houslet, premium in full B
772.	O. F. Roessler, supt., Privileges Dept., e
773.	Heath Stock Farm, partial premium B
774.	B. F. Davison, partial premium D
775.	R. L. Bollman, premium in full D
776.	Jos. Clauder, music, Clauder's Band
777.	Finch Bros., partial premium A
778.	Jos. Allyn, partial premium B
779.	Milwaukee Home Finding Assoc., meals f
780.	Adolph P. Arp, partial premiums B
781.	F. S. Bunker, partial premium B
782.	F. J. Clauss, partial premium B
783.	C. J. Poulter, partial premium C
784.	J. H. Greene & Son, premium in full A
785.	C. S. Hechtner, partial premium B
786.	D. H. Harris, Mgr., "Madam Marantette"
787.	Scott Deaner, partial premium B
788.	H. W. Ayers, partial premium B
789.	A. Liberati, music, Liberati's Band
790.	Henry Tennessen, premium in full A
791.	E. D. Jones & Son, partial premium B
792.	G. U. Fisher, Marshal's Department
793.	G. U. Fisher, Department of Grounds
794	John T. Edwards, partial premium A
795.	W. W. Vaughn & Son, partial premium D
796.	Renk Bros., partial premium
797.	F. K. Crossman, partial premium C
798.	A. H. Dahl, uncurrent check
799.	A. E. Rundell, partial premium A

o.	To whom paid.	Amount
00.	F. P. Adler, supplies for dining hall	13 50
01.	E. Crall & Son, premium in full C	10 00
02.	Mrs. F. Luebke, premium in full A	15 00
03.	E. R. Thomas & Son, premium in full B	35 00
04.	John D. Koontz, livery	59 00
05.	Chas. Dean, speed winnings	4,645 00
06.	Spring Brook Stock Farm, overpaid entry	2 50
07.	Geo. Phillipi, permium in full C	54 00
08.	Gilbert Horton, premium in full	45 50
09.	Adam Seitz, partial premium B	50 00
10.	A. W. Arnold, partial premium C	100 00
11.	J. W. Moore, judging cheese	8 35
12.	Logan W. Black, partial premium A	100 00
13.	E. M. Moore, partial premium C	65 00
14.	Alex Galbraith & Son, partial premium A	200 00
15.	Chas. H. Besecker, partial premium E	12 00
16.	A. H. Dahl, spurious coin	7 50
17.	Void.	
18.	E. W. Ripley, partial payment G	10 00
19.	F. R. Kuehl, music, Platteville Band	250 00
20.	Dick McMahon, speed winnings	1,025 00
21.	F. E. Stone, starting judge	150 00
22.	Otto Imse, meals for firemen	17 50
23.	E. Gumz, speed winnings	250 00
24.	R. Gumz, speed winnings	75 00
25.	F. S. Whitney, speed winnings	200 00
26.	Captain R. W. Mueller, drill "Troop A"	500 00
27.	H. E. Ross, speed winnings	450 00
28.	Theo. Sterneman, speed winnings	850 00
29.	Geo. C. Loomis, speed winnings	1,095 00
0.	F. L. Clemons, Gates Department	951 75
1.	J. W. Cooper, speed winnings	235 00
2.	F. W. Harding, partial payment B	1,000 00
3.	H. L. Austin, assistant supt. G	28 00
4.	Geo. Wylie, appropriation A	50 00
5.	James J. Nelson, appropriation L, and Dept. exp	100 00
6.	H. G. Potter, rent of rooms	16 50
7.	R. E. Searles, speed winnings	535 00
8.	Mrs. Norah E. R. Perkins, matron Woman's Rest	60 00
9.	Geo. G. Cox, Grand Stand Department	671 50
0.	Geo. G. Cox, appropriation Grand Stand Dept	50 00
1.	Geo. H. Simpson, partial payment A	30 00
2.	F. L. Clemons, expenses Gates Department	193 85
3.	Edwin Henderson, painting	91 72

No.	To whom paid.
844.	R. Connor Co., partial premiums B......
845.	Herman Mashmeyer, assistant supt. E...
846.	Walter Hartung, work in department D.
847.	Dr. F. R. Wright, drugs.................
848.	Dr. F. R. Wright, services as official phy
849.	J. A. Hazelwood, expenses department Q
850.	Nim Johnson & Son, premium less stall re
851.	J. B. Chandler, speed winnings..........
852.	Jacob Nolte, straw......................
853.	Lloyd Ranney, work in department E...
854.	David Wedgwood, supt. department K..
855.	D. R. Wedgwood, assistant supt. K.....
856.	Ray Knapp, work in Department E......
857.	G. U. Fisher, Marshal's Department.....
858.	J. J. Shaw, speed winnings..............
859.	K. McDermid, speed winnings..........
860.	W. H. Reed, partial premium D.........
861.	C. G. Wilcox, Speed Department.........
862.	W. P. Bussey, assistant supt. F. & H...
863.	O. E. Hooley, work in Forage Departme
864.	E. Finger & Son, hay and straw.........
865.	F. C. Borchert, assistant supt. E........
866.	Mark Wohld, assistant supt. J..........
867.	G. U. Fisher, expenses Marshal's Depar
868.	Sidney Smith, work in Forage Departme
869.	Frank Siegel, work in Forage Departme
870.	Mrs. Adda F. Howie, supt. department
871.	Oscar Paley, mail carrier................
872.	W. E. Fisher, hay.......................
873.	J. H. Cushing, straw....................
874.	Mrs. Lydia Vollbrecht, chamber maid....
875.	G. U. Fisher, Department of Grounds...
876.	John M. True, expenses fair............
877.	B. L. Wentworth, expenses fair.........
878.	American Trotting Assoc., suspensions co
879.	A. H. Dahl, expenses Treasurer's Depart
880.	Robert Burgess & Son, premium A.......
881.	Logan W. Black, balance premium A....
882.	Hans Berg, premium A..................
883.	W. P. Dunlop, premium in full A.......
884.	John T. Edwards, balance premium A...
885.	Finch Bros., balance premium A........
886.	Fox Bros., premium in full, A and B....
887.	Hardy & Bradley, premium in full A....

No.	To whom paid.	Amount
888.	Walter Harnischfeger, premium in full A............	10 00
889.	Robert Hardy, premium in full A.....................	30 00
890.	C. M. Mason, premium in full A.....................	7 00
891.	Gladys Nolte, premium in full A.....................	10 00
892.	Arthur Ott, premium in full A......................	25 00
893.	Progress Blue Ribbon Farms, premium in full A.....	54 00
894.	Dr. David Roberts, premium in full A................	68 00
895.	Geo. H. Simpson, premium in full A (balance)......	33 00
896.	Roy Southcott, premium in full A....................	25 00
897.	T. S. Simpson & Son, premium in full A.............	272 00
898.	Taylor & Jones, premium in full A..................	257 00
899.	Mrs. John T. Unertl, premium in full A..............	45 00
900.	R. S. Witte, premium in full A......................	110 00
901.	H. W. Ayers, balance premium B.....................	160 00
902.	Jos. Allyn, balance premium B......................	100 00
903.	Adolph P. Arp, balance premium B..................	100 00
904.	O. V. Battles, balance premium B...................	130 00
905.	F. S. Bunker, balance premium B....................	94 00
906.	F. J. Clouss, balance premium B.....................	100 00
907.	Cargill & McMillan, premium in full B...............	631 00
908.	R. Connor Co., balance premium B..................	83 00
909.	Scott Deaner, balance premium B...................	250 00
910.	A. W. Dopke, premium in full B.....................	28 00
911.	Fox & Gallagher, premium in full B.................	83 00
912.	Howard Greene, premium in full B..................	42 00
913.	F. W. Harding, balance premium B and C...........	483 00
914.	C. S. Hechtner, balance premium B.................	186 00
915.	J. G. Hickcox, premium in full B....................	73 00
916.	Mrs. Adda F. Howie, premium in full B............	85 00
917.	Heath Stock Farm, balance premium B..............	70 00
918.	Herr Bros. & Reynolds, premium in full B...........	553 00
919.	Geo. Ineichen & Son, balance premium B and D....	166 00
920.	John Irwin, balance premium B......................	127 00
921.	Wm. M. Jones, premium in full B....................	255 00
922.	Sam Jones & Son, premium in full B.................	206 00
923.	E. D. Jones & Son, balance premium B.............	40 00
924.	W. A. McHenry, premium in full B..................	205 00
925.	Muskego Lakes Jersey Herd, premium in full B......	25 00
926.	Geo. Martin, balance premiums B and D.............	116 00
927.	S. M. Quaw, premium in full B......................	150 00
928.	Rust Bros., premium in full B.......................	289 00
929.	J. C. Robinson, premium in full, less rent B & C....	202 50
930.	Geo. J. Schuster, premium in full B.................	107 00
931.	Adam Seitz, balance premium B......................	243 00

No. To whom paid.

932. Wililam Smiley, premium in full B..........
933. Jacob Slimmer, premium in full B..........
934. Alex Stewart Lumber Co., premium in full
935. Fred Vogel, Jr., premium in full B..........
936. A. W. Arnold, balance premium C..........
937. Uriah Cook & Son, premium in full C..........
938. Chandler Bros., premium in full C..........
939. L. Ellis, premium in full C..........
940. Gilbert Horton, premium in full C..........
941. Chas. T. Hill, premium in full D..........
942. N. M. Jewell & Son, premium in full C......
943. Lewis Bros., premium in full C..........
944. E. M. Moore, balance premium C..........
945. A. J. Mohr, balance premium C..........
946. Geo. McKerrow & Sons, premium in full C..
947. F. H. Patten, premium in full C..........
948. C. J. Poulter, balance premium C..........
949. Renk Bros., balance premium C..........
* 950. Spring Brook Stock Farm, balance premium
951. W. Woodard, premium in full C..........
952. J. B. Atwood & Son, premium in full D.....
953. W. G. Bartholf, balance premium D........
954. Balmat & Son, premium in full D..........
955. Bishop & Esterly, premium in full D........
956. B. F. Davison, balance premium D........
957. Heck Bros., premium in full D..........
958. J. L. Jones & Son, premium in full D.......
959. Humbert & White, balance premium D.....
960. J. W. Justice, balance premium D..........
961. A. N. Kelly, premium in full D..........
962. Geo. E. Kelly, balance premium D..........
963. L. P. Martiny, premium in full D..........
964. J. P. McCullom, balance premium D........
965. Marinette County Insane Asylum, premium
966. F. H. Meekin & Son, premium in full D.....
967. D. C. Patton, premium in full D..........
968. F. H. Patten, premium in full D..........
969. W. E. Palmer, premium in full D..........
970. M. W. Reed, premium in full D..........
971. C. G. Roup, balance premium D..........
972. W. H. Reed, balance premium D..........
973. Fred Southcott, premium in full D..........
974. William Stude, premium in full D..........
975. H. C. Taylor, premium in full D..........

No.	To whom paid.	Amount
976.	C. Tochtermann, premium in full D	80 00
977.	W. W. Vaughn & Son, balance premium D	50 00
978.	H. P. West, premium in full D	305 00
979.	W. C. Kassebaum, bill posting	75
980.	A. H. Carnegie, bill posting	15 75
981.	Karl Stussy, bill posting	18 00
982.	M. L. Smith, bill posting	2 00
983.	The Horse Review Co., advertising speed	24 24
984.	Spirit of the West, advertising speed	57 00
985.	Catholic Citizen, advertising	10 00
986.	The Wisconsin Farmer Co., advertising	40 00
987.	Germania—Herold Assoc., advertising	32 00
988.	Excelsior Publishing Co., advertising	10 00
989.	North Western Farmer, advertising	12 00
990.	Wisconsin Agriculturist, advertising	500 00
991.	Hoard's Dairyman, advertising	100 00
992.	Fairbanks, Morse & Co., scales and scale book	105 50
993.	The Evening Wisconsin Co., tickets	13 75
994.	Smith Premier Typewriter Co., rent of machine	3 00
995.	Siekert & Baum Stationery Co., mdse	1 45
996.	J. L. Martin, team for Transportation Department	18 00
997.	Brew Bros. Co., straw	30 42
998.	J. H. Gevaart, groceries for dining hall	116 04
999.	Jos. T. Holub, meat for dining hall	79 17
1000.	Douville Dairy Co., mdse. for dining hall	47 43
1001.	F. E. Walsh, coal	63 00
1002.	Arthur Stericker, judging light horses	42 50
1003.	R. A. Moore, judging grain	17 95
1004.	Minnie Barnekow, labor	8 17
1005.	Bertha Miller, labor	8 17
1006.	Chas. Miller, labor	44 80
1007.	A. Brown, labor	24 60
1008.	Welcome Meyer, labor	26 25
1009.	Fred Thiede, labor	21 00
1010.	Geo. De Bruine, labor	94 50
1011.	Chas. Rapp, labor	36 75
1012.	Herman Jaeger, labor	36 75
1013.	F. H. Marvin, labor	43 75
1014.	William Kenney, labor	36 75
1015.	John Stone, labor	35 87
1016.	Garry Wolf, labor	90 00
1017.	E. M. Shaw, labor	37 10
1018.	C. Fitzwilliam, labor	38 85
1019.	Dick Walsh, labor	41 20

No.	To whom paid.
1020.	John Miller, labor
1021.	Chas. Barnekow, labor
1022.	Chas. Spatz, labor
1023.	A. Brown, labor
1024.	C. Beerand, premium E
1025.	F. D. Bancroft, premium E
1026.	H. R. Brown, premium E
1027.	S. A. Brown & Son, premium E
1028.	Chas. Besecker, balance premium E
1029.	R. W. Boerner, premium E
1030.	F. G. Boots, premium E
1031.	Boots & Stier, premium E
1032.	Francis Biedler, premium E
1033.	John Conrad, premium E
1034.	Chas. Christensen, premium E
1035.	Dally & Trelor, premium E
1036.	Dawson Bros., premium E
1037.	August Dobberphul, premium E
1038.	Chas. M. Diedrich, premium E
1039.	Dailey & Bantow, premium E
1040.	H. J. Evans, premium E
1041.	Fountain City Poultry Yards, premium E
1042.	Paul Gerhard & Son, premium E
1043.	Theo. Gerlach, premium E
1044.	Robert Haylett, premium E
1045.	Oscar Huber, premium E
1046.	John H. Pagel, premium E
1047.	Chas. Haney, premium E
1048.	C. E. Judson, premium E
1049.	Walter E. Holmes, premium E
1050.	A. H. Kittinger, premium E
1051.	Frank Kittinger, premium E
1052.	Al Kroeger, premium E
1053.	P. H. Koenig, premium E
1054.	P. S. Knoerrschild, premium E
1055.	Mrs. J. Kazolke, premium E
1056.	Klose & Ueberall, premium E
1057.	Philip Koch, premium E
1058.	J. R. Love, premium E
1059.	Addison Love, premium E
1060.	John Luebtore, premium E
1061.	Harry Marks, premium E
1062.	A. H. McIntire, premium E
1063.	Nowak Bros., premium E

No.	To whom paid.	Amount
1064.	Mrs. Ethel Nelson, premium E	6 75
1065.	Orpington View Poultry Yards, premium E	3 00
1066.	O. P. Olson, premium E	1 00
1067.	C. E. Potter, premium E	3 00
1068.	William E. Prisk, premium E	7 00
1069.	W. E. Palmer, premium E	7 25
1070.	Aug. Pollworth, premium E	19 00
1071.	Louis Pierron Co., premium E	5 00
1072.	Pasbrig Bros., premium E	20 50
1073.	J. J. Rodig, premium E	2 50
1074.	E. G. Roberts, premium E	181 00
1075.	W. F. & S. S. Rippert, premium E	2 25
1076.	F. J. Strathman, premium E	10 00
1077.	H. J. Schulte, premium E	5 50
1078.	A. M. Schulz, premium E	4 25
1079.	E. J. Seyferth, premium E	3 00
1080.	R. J. Sawyer, premium E	3 00
1081.	F. Stier, premium E	9 00
1082.	Geo. W. Tulenz, premium E	19 50
1083.	Joseph Volz, premium E	2 00
1084.	Ferd Vanselow, premium E	2 00
1085.	H. Wallschlaeger, premium E	4 25
1086.	J. G. Walvord, premium E	5 00
1087.	William F. Augstein, premium E	2 00
1088.	Jos. K. Barta, Jr., premium E	10 50
1089.	Oscar Buxbaum, premium E	6 50
1090.	Walter Bahr, premium E	9 00
1091.	R. B. Dobrogowski, premium E	42 00
1092.	Mrs. R. B. Dobrogowski, premium E	17 00
1093.	Geo. Ewald, premium E	193 50
1094.	Peter Elmer, premium E	1 00
1095.	A. Frantz, premium E	11 00
1096.	R. Falbe, premium E	3 00
1097.	A. M. Fiebrantz, premium E	5 00
1098.	J. C. Hug, premium E	2 00
1099.	J. Horn, premium E	9 00
1100.	Herman Kretschmer, premium E	11 50
1101.	William Korb, premium E	10 50
1102.	Walter Korb, premium E	15 00
1103.	John Kazolka, premium E	7 00
1104.	William Lueps & Son, premium E	6 00
1105.	Albert Magnus, Jr., premium E	1 00
1106.	Thos. B. McCauley, premium E	14 00
1107.	Aug. Neess, premium E	1 00

No.	To whom paid.
1108.	M. Pasbrig, premium E
1109.	F. J. Roe, premium E
1110.	Walter W. Rugowski, premium E
1111.	Mrs. E. Reuter, premium E
1112.	Theo. Reuter, premium E
1113.	W. F. & L. S. Rippert, premium E
1114.	H. C. Schmidt, premium E
1115.	F. L. Schmidt & Son, premium E
1116.	C. R. Schubert, premium E
1117.	Ferd Vanselow, premium E
1118.	Herman Vanselow, premium E
1119.	H. Williamsen, premium E
1120.	F. H. Williamsen, premium E
1121.	C. Williamsen, premium E
1122.	T. Williamsen, premium E
1123.	P. B. Haber, bill posting
1124.	Gust Schreiber, premiums F and G
1125.	John Hans, premium F
1126.	A. Selle, premium F
1127.	H. P. West, premiums F and G
1128.	F. H. Meekin & Son, premiums F and G
1129.	A. L. Kleeber, premium F
1130.	H. E. Krueger, premium F
1131.	W. F. Pilgrim, premiums F and G
1132.	F. J. Lindley, premium F
1133.	J. H. Pilgrim, premium F
1134.	Robert Pilgrim, premium F
1135.	Justin Grape, premium F
1136.	C. H. Howitt, premiums F and G
1137.	Toole Bros., premium F
1138.	Henry J. Schulte, premium F
1139.	Stiles & Zahr, premium F
1140.	Mrs. J. Hans, premium F
1141.	A. N. Kelly, premiums F and G
1142.	A. C. Ellickson, premium F
1143.	E. L. Benedict, premiums F and G
1144.	Vernon Kinney, premium F
1145.	Geo. Martin, premium F
1146.	Lizzie Mayer, premium F
1147.	William McMorran, premium F
1148.	E. W. Ripley, balance premiums F and
1149.	Geo. Schleomer, premium F
1150.	H. Ziemer, premium F
1151.	Ben Hans, premium F

No.	To whom paid.	Amount
1152.	H. Vaughn West, premium F	7 00
1153.	Joseph Pilgrim, premium F	32 00
1154.	Frank Benedict, premium F	48 00
1155.	Harold A. Lewis, premium F	11 00
1156.	Henry Twinem, premium F	23 00
1157.	Addison Love, premium F	31 00
1158.	Ralph Pilgrim, premium F	7 00
1159.	Francis Tennis, premium F	20 00
1160.	John Grape, premium G	50 00
1161.	Democrat Printing Co., subscription	2 50
1162.	John Reis, premium H	113 50
1163.	Henry Fox, premium H	84 75
1164.	A. D. Barnes, premium H	67 75
1165.	Toole Bros., premium H	14 75
1166.	John Grape, premium H	10 00
1167.	J. S. Palmer, premium H	101 75
1168.	A. N. Kelly, premium H	24 50
1169.	Geo. J. Jeffery, premium H	51 00
1170.	E. L. Benedict, premium H	5 00
1171.	W. J. Moyle, premium H	13 00
1172.	Kellogg & Schultz, premium H	26 00
1173.	John W. Dunlap, premium H	95 00
1174.	Alex Klokner, premium H	88 00
1175.	Allister Currie, premium H	31 00
1176.	H. W. Koerner, premium H	38 00
1177.	Hunkel's Seed Store, premium H	2 00
1178.	Mrs. C. E. Strong, premium H	51 00
1179.	Mrs. A. R. Radtke, premium H	5 00
1180.	Mrs. Thomas Bowes, premium H	12 00
1181.	Mrs. J. J. Hannon, premium H	8 00
1182.	W. F. Pilgrim, premium H	3 00
1183.	Henry J. Schulte, premium H	3 00
1184.	Edward Amerpohl, premium H	50 00
1185.	Heitman & Baerman, premium H	40 00
1186.	Rudolph C. Preuss, premium H	30 00
1187.	F. C. Kaiser, premium H	20 00
1188.	Ella M. Goelzer, premium M	8 00
1189.	Mrs. L. W. Barnes, premiums H and M	51 00
1190.	Mary Hart, premiums H and M	15 00
1191.	Mrs. S. W. Poppe, premium H and M	59 00
1192.	Mrs. W. W. Paine, premiums L, H and M	14 00
1193.	Mrs. Robert Ramsey, premiums G and H	127 00
1194.	Edna L. Stoppenbach, premiums L, H and M	19 00
1195.	Mrs. W. P. Wegner, premiums H and M	71 00

No.	To whom paid.
1196.	Mrs. A. A. White, premiums H and M.
1197.	Mrs. A. I. Clapp, premiums H and M..
1198.	Mrs. R. Wendland, premiums L and
1199.	Mrs. E. C. Hoffman, premium M......
1200.	Mrs. Henry Fischer, premium M.......
1201.	Mrs. Giles Hibbard, premium M .....
1202.	Minnie Dykins, premium M............
1203.	Edna Simonton, premium M............
1204.	Mrs. Martin Dreyfus, premium M.......
1205.	Ida Waecker, premium M...............
1206.	Ida L. Kuehn, premium M.............
1207.	Mrs. F. McAneny, premium M..........
1208.	Mrs. J. Kornely, premium M...........
1209.	Mrs. A. H. Bartz, premium M...........
1210.	Mrs. A. Glovinske, premium M........
1211.	Clara Mueller, premium M.............
1212.	Mrs. C. C. Barrett, premium M........
1213.	Mrs. Neil McFayden, premium M.......
1214.	Mrs. W. E. Langenberg, premium M...
1215.	Miss C. J. Smith, premium M..........
1216.	Mrs. I. N. Betten, premium M..........
1217.	Harriette Evans, premium M...........
1218.	Mrs. Addie M. Witte, premium M.......
1219.	Alma Biegelaar, premium M............
1220.	Harriett E. Zaun, premium M..........
1221.	Mrs. Susie Abert, premium M..........
1222.	Mrs. T. W. Baker, premium M.........
1223.	Mary E. Keogh, premium M............
1224.	Mrs. James E. Rogers, premium M.....
1225.	Mrs. Frank Remlinger, premium M.....
1226.	Mrs. M. Casperson, premium M........
1227.	Mrs. G. Herman, premium M...........
1228.	Mrs. Chas. H. Wood, premium M......
1229.	Anna Ludwig, premium M..............
1230.	Lucy Cavell, premium M...............
1231.	Mrs. Anna L. Corwith, premium M.....
1232.	Mrs. John Hans, premium M............
1233.	Mrs. W. Claridge, premium M..........
1234.	Mrs. L. Yanke, premium M............
1235.	Mrs. F. Wakefield, premium M.........
1236.	Mrs. C. G. Lee, premium M............
1237.	Mrs. J. R. Hommel, premium M........
1238.	Mrs. J. C. Thomson, premium M.......
1239.	Mrs. E. Paglow, premium M...........

No.	To whom paid.	Amount
1240.	Mrs. E. W. Karrar, premium M	2 00
1241.	Katie Bodden, premium M	1 00
1242.	Mrs. R. C. Smith, premium M	2 00
1243.	Adelaide O'Keef, premium M	5 00
1244.	Mrs. P. De Bruine, premium M	3 00
1245.	Mrs. Frank J. Granger, premium M	36 00
1246.	Mrs. William Sweeney, premium M	3 00
1247.	Mrs. E. L. Douville, premium M	7 00
1248.	Miss M. Riordan, premium M	3 00
1249.	Mary Pitzke, premium M	12 00
1250.	Alma Wolff, premium M	3 00
1251.	Mrs. A. Le Feber, premium M	6 00
1252.	Mrs. F. F. Riha, premium M	2 00
1253.	Bertha Puerner, premium M	10 00
1254.	Mrs. Julius Jahnke, premium M	4 00
1255.	Lizzie Mayer, premium M	6 00
1256.	Mrs. Edna L. Sinsel, premium M	2 00
1257.	Mrs. F. C. Elliott, premium M	16 00
1258.	William E. Prisk, premium G	123 00
1259.	E. D. Ochsner, premium G	73 00
1260.	A. L. Kleeber, premium G	74 00
1261.	W. H. Putnam, premium G	70 50
1262.	Mrs. William E. Prisk, premium G	8 00
1263.	J. J. Ochsner, premium G	27 00
1264.	Samuel Weiler, premium G	12 00
1265.	E. R. Thomas & Son, premium G	8 00
1266.	Henry Teserick, premium G	6 00
1267.	Joseph M. Barr, premium G	6 00
1268.	Joseph Volz, premium G	26 00
1269.	Francisco Spicuzza, premium L	55 00
1270.	F. Heckman, premium L	57 00
1271.	C. H. Boettcher, premium L	48 00
1272.	Frederick Stoltenberg, premium L	10 00
1273.	Marjorie Falbe, premium L	14 00
1274.	G. Busalachi, premium L	21 00
1275.	Hans Stoltenberg, premium L	5 00
1276.	Walter J. Wittich, premium L	4 00
1277.	Ruth R. Shutts, premium L	21 00
1278.	A. M. Johnson, premium L	5 00
1279.	R. Schoen, premium L	3 00
1280.	M. G. Schley, premium L	10 00
1281.	Grace H. Martin, premium L	3 00
1282.	George Illian, premium L	5 00
1283.	Franklin Lyons, premium L	3 00

No.	To whom paid.
1284.	C. Tyrell, premium L.
1285.	B. F. Langland, premium L.
1286.	J. H. Field, premium L.
1287.	B. C. Roloff, premium L.
1288.	Nick Bruehl, premium L.
1289.	A. L. White, premium L.
1290.	Geo. J. Boss, premium L.
1291.	Mrs. Anna E. Pierce, premium L.
1292.	Mrs. H. M. Serg, premium L.
1293.	A. R. Tibbits, premium L.
1294.	Mrs. E. Lindquist, premium L.
1295.	Mrs. B. F. Yost, premium L.
1296.	Mrs. A. E. Arthur, premium L.
1297.	Mrs. P. M. Kynaston, premium L.
1298.	Mrs. E. E. Mills, premium L.
1289.	Mrs. H. W. Haskell, premium L.
1300.	Mrs. O. F. Priebe, premium L.
1301.	Mrs. L. C. Baker, premium L.
1302.	Mrs. J. W. Cutler, premium L.
1303.	Edna Anderson, premium O.
1304.	Elsie Albers, premium O.
1305.	Assumption School, West Allis, premium
1306.	Bessie Brewer, premium O.
1307.	Alma Brown, premium O.
1308.	Elsie Berry, premium O.
1309.	Stanley Briggs, premium O.
1310.	Christian Brei, premium O.
1311.	Grace Brechtel, premium O.
1312.	William Bland, premium O.
1313.	Carl Cowers, premium O.
1314.	Esther Blackmer, premium O.
1315.	Lottie Bell, premium O.
1316.	George Bloor, premium O.
1317.	Alva Butter, premium O.
1318.	Albert Claridge, premium O.
1319.	Pearl Claridge, premium O.
1320.	Thomas Claridge, premium O.
1321.	Clarence Claridge, premium O.
1322.	Stella Courtier, premium O.
1323.	Sarah Crane, premium O.
1324.	Eva Conry, premium O.
1325.	Clara Coutremarsh, premium O.
1326.	David Conrad, premium O.
1327.	Otto Conrad, premium O.

No.	To whom paid.	Amount
1328.	Mary Donohue, premium O	2 00
1329.	A. Downey, premium O	1 00
1330.	Nellie Dalgleist, premium O	2 00
1331.	Carol Davidson, premium O	1 50
1332.	Anna Doerfler, premium O	3 00
1333.	Lydia Dankworth, premium O	1 50
1334.	Daisy Dean, premium O	1 50
1335.	Max Davidson, premium O	2 00
1336.	Anna Doyle, premium O	1 50
1337.	Ida Dulde, premium O	2 00
1338.	Geo. Debol, premium O	2 00
1339.	Edna Daniels, premium O	2 00
1340.	Gertrude Doyle, premium O	2 50
1341.	East Division High School, Milwaukee, premium O	17 50
1342.	Frank Edwards, premium O	1 00
1343.	Myrtle Eichenberg, premium O	2 00
1344.	Irene Engfer, premium O	1 00
1345.	Edwin Freundt, premium O	3 00
1346.	Arthur Fish, premium O	3 00
1347.	Ethel Gardner, premium O	2 00
1348.	Nellie Dougherty, premium O	2 00
1349.	Bessie Fuller, premium O	7 50
1350.	Gertrude Foote, premium O	5 00
1351.	I. N. Meehan, premium O	1 50
1352.	Ruby Gratsinger, premium O	4 00
1353.	Sophie Goetz, premium O	1 50
1354.	Martha Gray, premium O	2 00
1355.	Mame Gettelman, premium O	1 00
1356.	Olive Glassner, premium O	1 00
1357.	Henry Gould, premium O	2 00
1358.	Katherine Thomas, premium O	3 50
1359.	Gertrude Gram, premium O	1 00
1360.	Grace Gould, premium O	1 00
1361.	Harold Haskell, premium O	2 00
1362.	Harriett Holman, premium O	1 50
1363.	Lloyd Hackett, premium O	2 50
1364.	Carrie Hutter, premium O	2 00
1365.	Perle Hendershot, premium O	1 00
1366.	Juliet Hahn, premium O	3 00
1367.	Armin Hansen, premium O	4 50
1368.	Grace Horne, premium O	1 50
1369.	Evelyn Guhr, premium O	1 00
1370.	Gisella Haas, premium O	2 50
1371.	Edna Hoh, premium O	2 00

No.	To whom paid.
1372.	Lawrence Kuhn, premium O
1373.	Fred Kinney, premium O
1374.	Walter Kammerman, premium O
1375.	Esther Koepke, premium O
1376.	Flora Kesselhut, premium O
1377.	Urvin Kaempf, premium O
1378.	Margaret Kielblock, premium O
1379.	Harold Koerner, premium O
1380.	Alma Koeppen, premium O
1381.	Bessie Kellogg, premium O
1382.	Carrie Lawrenz, premium O
1383.	Joe Listen, premium O
1384.	Margaret Lathers, premium O
1385.	Supt. Jones, Lincoln School, premium O
1386.	Mabel Assel, premium O
1387.	Nore Buss, premium O
1388.	Mina B. McIlree, premium O
1389.	Marie Le Feber, premium O
1390.	Carl Marks, premium O
1391.	Lucy McCarthy, premium O
1392.	Celia Mosher, premium O
1393.	Isadore Muskat, premium O
1394.	Mathilda Mohr, premium O
1395.	Walter Moehrig, premium O
1396.	Nellie Murphy, premium O
1397.	Daniel McCount, premium O
1398.	Sarah McIntyre, premium O
1399.	Jessie Marr, premium O
1400.	Florence Main, premium O
1401.	Gertrude McCullom, premium O
1402.	Flora Mueller, premium O
1403.	Edith McCarthy, premium O
1404.	Elizabeth Bernard, premium O
1405.	Maggie Masters, premium O (teacher)
1406.	Silas Nachreiner, premium O
1407.	Harriett Maylard, premium O
1408.	Willard Maylard, premium O
1409.	Esther Milbrandt, premium O
1410.	Josephine Myers, premium O
1411.	Esther Lathers, premium O
1412.	Minnie Luethold, premium O
1413.	Minnie Milbrandt, premium O
1414.	Lee Milbrandt, premium O
1415.	Ida Oehrke, premium O

No.	To whom paid.	Amount
1416.	Arthur Orloff, premium O	1 00
1417.	Bertha Pfister, premium O	2 00
1418.	Eunice Pearson, premium O	3 50
1419.	Eber Pugh, premium O	1 50
1420.	Lulu Powell, premium O	3 00
1421.	Lillian Procknow, premium O	1 50
1422.	Clara Olson, premium O	2 00
1423.	Emma Mishock, premium O	2 00
1424.	Anna Paulus, premium O	2 00
1425.	Mary Ledwing, premium O	2 00
1426.	Amelia Reese, premium O	1 00
1427.	Henry Risley, premium O	3 00
1428.	Sophia Rust, premium O	2 50
1429.	Edna Rilling, premium O	1 00
1430.	Fred Rietbrock, premium O	1 50
1431.	Mabel Russell, premium O (teacher)	25 00
1432.	Prof. W. P. Roseman, Watertown, premium O	46 00
1433.	Kate Smith, premium O	2 25
1434.	Rena Smith, premium O	2 00
1435.	Iva Swartz, premium O	1 50
1436.	Edna Smith, premium O	1 00
1437.	Leonard Schoenmann, premium O	1 00
1438.	Christina Schwartz, premium O	4 50
1439.	Edith Schoenmann, premium O	4 00
1440.	Willie Samp, premium O	2 00
1441.	Mary Spry, premium O	1 50
1442.	Beatrice Siekert, premium O	2 00
1443.	Elizabeth Schroeder, premium O	3 50
1444.	Ruth Sparks, premium O	1 50
1445.	Lulu Titus, premium O	1 50
1446.	Letta Tyrell, premium O	1 50
1447.	Eleanor Wilbur, premium O	1 50
1448.	Grace Thering, premium O	1 50
1449.	Irwin Wagner, premium O	1 50
1450.	Cecilia Homes, premium O	2 00
1451.	Hattie Ward, premium O	3 50
1452.	Adele Webb, teacher, premium O	8 00
1453.	Frederick Wagner, premium O	4 00
1454.	Geo. Waldman, premium O	1 50
1455.	Beatrice Stewart, premium O	1 50
1456.	Louis Wechselberg, premium O	1 50
1457.	Viola Weber, premium O	2 00
1458.	Terence Weber, premium O	2 00
1459.	Howard Van Euryk, premium O	1 50

No.	To whom paid.
1460.	C. G. Wilcox, exp. acct. and appropriation
1461.	James J. Nelson, expenses
1462.	Geo. Wylie, expenses
1463.	J. L. Herbst, expenses and appropriation
1464.	J. L. Herbst, purchases
1465.	L. E. Scott, balance appropriation and expen
1466.	R. B. Watrous, appropriation
1467.	C. L. Hill, expenses and appropriation
1468.	C. H. Everett, expenses and appropriation
1469.	John M. True, expenses Fair
1470.	H. Stanley Green, Mgr. Plankington House, e Missouri Board
1471.	Thomas Corneliuson, judging butter
1472.	F. S. Bunker, overpaid stall rent
1473.	Renk Bros., overpaid pen rent
1474.	Alex Klokner, professional services
1475.	William Beattie, assistant A
1476.	W. R. Chipman, assistant A
1477.	W. A. McHenry, premium B
1478.	D. B. Danielson, advance for labor
1479.	Nowing Publishing Co., advertising
1480.	Kuryer Publishing Co., advertising
1481.	Germania-Herald Co., advertising
1482.	News Publishing Co., advertising
1483.	Milwaukee Free Press, advertising
1484.	Sentinel Co., advertising
1485.	Evening Wisconsin, advertising
1486.	Journal Co., advertising
1487.	Saxe Sign Co., signs
1488.	Schuppert-Zoeller Co., printing
1489.	Streissguth-Petran Co., engraving
1490.	Milwaukee Posting Service Co., services
1491.	Cream City Bill Posting Co., services
1492.	E. T. Hindman, photographs
1493.	Wisconsin Telephone Co., services
1494.	Central Riding Academy, saddle horses
1495.	Wauwatosa Stone Co., mdse
1496.	Sands Lumber Co., mdse
1497.	Model Iron & Wire Works, mdse
1498.	Smith-Blodgett Co., mdse
1499.	Biersach & Niedermeyer, sign on Cattle Build
1500.	Roberts & Fisher Sand Co., mdse
1501.	J. C. James, sand
1502.	F. E. Walsh, cement

No.	To whom paid.	Amount
1503.	The Rockwell Mfg. Co., mdse..........................	22 84
1504.	J. E. Patton Co., mdse..............................	13 49
1505.	Rundle-Spence Mfg. Co., mdse.........................	643 73
1506.	O'Neil Oil & Paint Co., mdse........................	69 25
1507.	Kroeger Bros., mdse..................................	17 57
1508.	John Pritzlaff Hardware Co., mdse...................	177 45
1509.	Wilbur Lumber Co., mdse.............................	907 53
1510.	Otto L. Loeffler, hauling pipe.......................	17 43
1511.	City of Milwaukee, pipe...............................	401 88
1512.	Math Michels, judging butter.........................	2 94
1513.	M. H. Meyer, judging butter..........................	9 88
1514.	Rambler Garage Co., floating track..................	48 00
1515.	Joys Bros. Co., rent of tent...........................	5 00
1516.	Germania Publishing Co., advertising farm paper...	40 00
1517.	Russell-Porter Hdw. Co., plumber's work............	49 85
1518.	James Hanrahan, services as fireman.................	36 00
1519.	William Seeger, services as fireman.................	36 00
1520.	John H. Schulte, services as fireman................	36 00
1521.	Myrom McPherson, painting..........................	20 60
1522.	M. E. Henika, sprinkling grounds.....................	13 80
1523.	Standard Oil Co., mdse..............................	12 65
1524.	Wadhams Oil Co., oil for streets......................	211 50
1525.	J. H. Gevaart, gasoline..............................	20 39
1526.	Star Laundry Co., work..............................	14 07
1527.	William Murdoch, cement blocks......................	14 25
1528.	Philip Gross Hdw. Co., safe..........................	35 55
1529.	Heitman & Baerman, planting flower beds...........	18 00
1530.	John Barnekow, straw...............................	23 80
1531.	Farmer's Record, advertising.........................	15 00
1532.	Robert P. Hansen Co., sand..........................	2 75
1533.	Bart J. Ruddle, services as press agent, etc..........	276 95
1534.	C., M. & St P. Ry. Co., freight......................	17 60
1535.	R. L. Adams, sales J..................................	4 40
1536.	Andrew Anderson, sales J, less entry................	2 18
1537.	Bert Andrea, premium and sales J, less entry.......	32 18
1538.	F. W. Ashman, premium and sales J, less entry.....	7 74
1539.	Frank Bowar, premium and sales J..................	26 44
1540.	A. Bauer, premium and sales J, less entry...........	6 33
1541.	W. C. Boldt, premium and sales J...................	25 91
1542.	Philip Becker, sales J...............................	5 72
1543.	O. B. Bengstad, premium and sales J, less entry....	20 73
1544.	T. J. Berg, sales J, less entry........................	2 40
1545.	Joseph Bauer, premium and sales J, less entry.......	6 11
1546.	J. M. Bibby, premium and sales J, less entry........	5 89

No.	To whom paid.	Amount
1547.	Joseph Beadle, sales J, less entry	3 72
1548.	H. Boerschinger, premium and sales J, less entry	7 93
1549.	W. L. Becker, sales J, less entry	4 82
1550.	J. W. Curtis & Son, premium and sales J	17 79
1551.	R. P. Christenson, premium and sales J, less entry	17 02
1552.	W. J. Clark, premium and sales J	26 66
1553.	Will Conway, premium and sales J	53 57
1554.	S. B. Cook, premium and sales J, less entry	6 11
1555.	Allen Carswell, premium and sales J, less entry	22 80
1556.	Herman A. Curt, premium and sales J, less entry	7 95
1557.	R. J. Clark, premium and sales J, less entry	8 18
1558.	Walter Christensen, premium and sales J, less entry	17 02
1559.	L. Dabareiner, premium and sales J	11 82
1560.	John F. Dahl, sales J, less entry	1 95
1561.	Herman Dusell, premium and sales J	6 45
1562.	J. F. Dabareiner, sales J	6 60
1563.	D. DeBuhr, premium and sales J, less entry	13 87
1564.	J. Enright, premium and sales J	24 23
1565.	Albert Ericksen, premium and sales J, less entry	18 87
1566.	Edmund Eckwright, premium and sales J, less entry	15 16
1567.	Henry Eberhardt, sales J, less entry	3 94
1568.	J. L. Frank, premium and sales J	13 45
1569.	H. Fassbender, sales J	4 18
1570.	W. J. Feind, premium and sales J	16 95
1571.	A. O. Filbach, sales J	7 04
1572.	P. W. Guse, premium and sales J	6 48
1573.	Fred Grimm, sales J, less entry	2 40
1574.	R. A. Garlock, sales J	4 62
1575.	John H. Grady, sales J	2 18
1576.	Otto Gierach, sales J, less entry	1 95
1577.	Jorgen Gormsen, sales J, less entry	2 62
1578.	O. J. Groth, premium and sales J	32 23
1579.	A. C. Haberstick, sales J	4 62
1580.	Edward Helmke, premium and sales J	24 58
1581.	William Haag, sales J	9 44
1582.	Helendale Farms, sales J	6 60
1583.	C. H. Howitt, sales J	1 10
1584.	L. F. Hoppe, sales J	4 62
1585.	L. P. Holgerson, premium and sales J	23 27
1586.	A. B. Hoyt, sales J	12 54
1587.	O. H. Hansen, premium and sales J, less entry	17 45
1588.	David Hall, sales J, less entry	2 40
1589.	Aug. M. Hein, premium and sales J, less entry	11 51
1590.	E. E. Hammond, premium and sales J	19 20

No.	To whom paid.	Amount
1591.	H. W. Handy, sales J	2 62
1592.	C. L. Hall, sales J	11 86
1593.	J. J. Jackson, premium and sales J	32 40
1594.	Chr. J. Jensen, sales J	4 62
1595.	W. G. Jamison, premium and sales J	3 94
1596.	O. C. Jacobsen, sales J	1 96
1597.	M. Johnson, premium and sales J	73 92
1598.	E. H. Kielsmeier, sales J	8 14
1599.	L. M. Kohel, sales J	5 50
1600.	O. A. Kielsmeier, premium and sales J	22 61
1601.	Chas. D. Kelly, sales J	1 32
1602.	A. L. Kleeber, premium and sales J	6 67
1603.	H. H. Kubat, premium and sales J, less entry	3 82
1604.	Fred E. Klussendorf, sales J	2 40
1605.	Aug. F. Koehn, sales J, less entry	5 04
1606.	C. F. Langkilde, sales J	5 72
1607.	F. J. Lindley, premium and sales J	10 93
1608.	Mrs. A. W. Lehman & Son, sales J, less entry	3 52
1609.	Sever Lee, sales J	2 40
1610.	O. D. Lundstadt, sales J	2 40
1611.	Guy E. Melendy, sales J	4 40
1612.	Math Meyer, premium and sales J	47 79
1613.	J. C. Miller, premium and sales J	6 48
1614.	Ed Meracle, premium and sales J	26 88
1615.	John Mortensen, sales J, less entry	2 40
1616.	John Mitchell, sales J	5 94
1617.	J. C. Mason, premium and sales J	9 96
1618.	A. McLane, sales J	2 40
1619.	W. A. Moyes, premium and sales J, less entry	14 94
1620.	O. R. McCormick, premium and sales J, less entry	4 48
1621.	J. T. Mogle, sales J, less entry	2 62
1622.	A. A. Mueller, premfum and sales J	15 75
1623.	E. C. McCormick, sales J, less entry	2 40
1624.	John Martinek, premum and sales J, less entry	15 38
1625.	H. A. Main, premium and sales J	38 95
1626.	Thomas O'Neill, premium and sales J	10 99
1627.	Otto Olsen, premium and sales J	21 09
1628.	Lauritz Olson, premium and sales J	21 05
1629.	C. H. Prust, sales J	4 40
1630.	Robert Pilgrim, premium and sales J	13 63
1631.	E. J. Pischke, premium and sales J, less entry	11 45
1632.	L. A. Pollard, sales J, less entry	3 72
1633.	L. A. Pelletier, sales J, less entry	20
1634.	Arthur G. Puerner, sales J, less entry	11 20

No.	To whom paid.	Amount
1635.	J. H. Pilgrim, sales J	88
1636.	H. P Quakenbush, sales J, less entry	4 60
1637.	F. A. Rivers, premium and sales J	13 31
1638.	H. C. Raven, premium and sales J, less entry	20 73
1639.	F. E. Raven, sales J, less entry	2 18
1640.	H. L. Rausch, sales J, less entry	2 62
1641.	Mrs. William Sweeney, prem. and sales J, less entry	19 05
1642.	G. P. Sauer, premium and sales J, less entry	35 76
1643.	F. E. Snyder, premium and sales J	12 04
1644.	Geo. S. Seyfert, premium and sales J, less entry	7 74
1645.	Fred Sorenson, premium and sales J, less entry	13 75
1646.	O. B. Sather premium and sales J, less entry	4 23
1647.	Guy Tyler, sales J	3 95
1648.	William White, sales J	13 42
1649.	T. J. Warner, sales J	5 72
1650.	A. E. Woodstock, premium and sales J	30 37
1651.	John Wyss, premium and sales J, less entry	8 18
1642.	Wittenberg Creamery Co., sales J, less entry	2 40
1653.	Glen C. Whitney, premium and sales J, less entry	10 32
1654.	L. H. Winter, sales J, less entry	2 40
1655.	A. H. Wilcox, premium and sales J, less entry	19 28
1656.	G. E. Young, sales J, less entry	20
1657.	A. N. Yates, sales J, less entry	2 40
1658.	A. W. Zimmerman, premium and sales J	19 63
1659.	Erwin Schaefer, sales J	4 82
1660.	W. B. Taylor, speed winnings	455 50
1661.	A. H. Dahl, redemption protested check	150 50
1662.	A. H. Dahl, redemption protested check	27 10
1663.	A. H. Dahl, redemption protested check	301 50
1664.	J. G. Boyd, premium in full A	220 00
1665.	Geo. F. Carroll, premium in full A	94 00
1666.	Ethelwold Farms, balance premium A	164 00
1667.	Alex Galbraith & Son, balance premium A	286 00
1668.	A. R. Ives, premium A	151 00
1669.	J. C. Land, premium in full A	114 00
1670.	Lewis Lewellin & Sons, premium,in full A	227 00
1671.	J. McD. Randles, premium in full A	90 50
1672.	McLay Bros., premium in full A	634 00
1673.	G. N. Mihills, balance premium A	150 00
1674.	Pabst Stock Farm, premium in full A	411 00
1675.	A. E. Rundell, premium in full A	65 00
1676.	Lewis Roberts, premium in full A	45 00
1677.	Sleep Bros., premium in full A	169 00
1678.	Fred Southcott, premium in full A	50 00

No.	To whom paid.	Amount
1679.	Uihlein Bros., premium in full A	433 00
1680.	O. V. Battles, balance premium B	69 00
1681.	Alex Stewart Lumber Co., balance premium B	33 00
1682.	Casper Anderegg, premium and sales J	10 92
1683.	Jacob Alder, premium and sales J	13 29
1684.	Jacob Andrea, premium and sales J	12 63
1685.	Chas. Ahlswede, sales J	5 52
1686.	John Altman, premium and sales J, less entry	10 68
1687.	H. W. Austin, sales J, less entry	1 64
1688.	C. A. Bahr, premium and sales J	15 80
1689.	Jacob Baumberger, premium and sales J, less entry	113 32
1690.	Geo. W. Bean, premium and sales J	8 72
1691.	Paul Borham, premium and sales J	7 36
1692.	Jacob Baehler, premium and sales J	25 51
1693.	Walter Bean, premium and sales J	14 19
1694.	Ernest Ball, premium and sales J	15 54
1695.	Chris Bigler, sales J	6 00
1696.	Aug. H. Blanck, premium J	9 35
1697.	Fred Bauer, premium and sales J	7 01
1698.	Geo. E. Beck, sales J, less entry	47
1699.	Joseph Berg, sales J, less entry	47
1700.	A. Benishek, premium and sales J, less entry	8 19
1701.	A. P. Boies, premium and sales J, less entry	12 83
1702.	John Beemster, sales J	1 30
1703.	Julius Berg, sales J, less entry	1 88
1704.	John Barkovitz, premium and sales J, less entry	8 07
1705.	Louis Blohnik, premium and sales J, less entry	7 37
1706.	C. H. Chandler, sales J	7 17
1707.	R. Conrad, premium and sales J	20 41
1708.	E. Coates, premium and sales J, less entry	3 33
1709.	F. H. Carpenter, premium and sales J, less entry	4 17
1710.	L. L. Clark, premium and sales J, less entry	4 32
1711.	Franz Chinger, premium and sales J, less entry	7 60
1712.	E. H. Carlson, premium and sales J, less entry	5 19
1713.	M. G. Douma, premium and sales J	6 20
1714.	D. DeBuhr, sales J, less entry	47
1715.	William Engelland, premium and sales J	12 87
1716.	Otto Freund, premium and sales J	20 37
1717.	J. A. Fuller, sales J	2 23
1718.	A. W. Finstad, premium and sales J, less entry	9 20
1719.	John Fagan, sales J, less entry	1 29
1720.	F. A. Flynn, premium and sale J	9 62
1721.	Louis Falck, premium and sales J	20 48
1722.	C. H. Good, sales J	2 47

No.	To whom paid.	Amount
1723.	Arnold Grimm, premium and sales J, less entry......	8 00
1724.	A. P. Geiger, premium and sales J, less entry.......	5 18
1725.	William Germain, sales J, less entry..................	1 41
1726.	W. C. Ganschow, premium and sales J.............	27 85
1727.	P. E. Geimer, sales J, less entry......................	2 82
1728.	Louis Hasse, premium and sales J....................	35 65
1729.	Fred S. Hadler, premium and sales J................	23 31
1730.	William Haag, sales	3 41
1731.	F. J. Haack, sales J.....................................	2 23
1732.	F. J. Harder, premium and sales J, less entry.......	1 09
1733.	J. A. Hanchett, sales J, less entry....................	5 05
1734.	E. Hessig, premium and sales J, less entry..........	12 39
1735.	W. B. Hatch, sales J, less entry......................	47
1736.	Henry Johnson, sales J, less entry....................	4 23
1737.	U. L. Johnson, sales J, less entry....................	1 29
1738.	Albert F. Koopman, premium and sales J............	9 81
1739.	Guy M. Pelton, work in office..........................	25 00
1740.	Glenn E. Pelton, work in office........................	25 00
1741.	Fred W. Kaller, premium and sales J.................	5 35
1742.	H. J. Kuschel, premium and sales J..................	10 00
1743.	John G. Kennedy, premium and sales J...............	11 35
1744.	Otto A. Kielsmeier, premium and sales J............	18 33
1745.	Robert Kohli, premium and sales J....................	14 36
1746.	R. C. Kielsmeier, premium and sales J...............	18 63
1747.	J. F. Falk, premium and sales J......................	10 00
1748.	W. J. Kueppmiller, premium and sale J..............	1 37
1749.	J. J. Kuhn, sales J, less entry.........................	23
1750.	Oscar Knudsen, sales J, less entry..................	35
1751.	J. B. Kurtz, sales J, less entry........................	23
1752.	Otto Kumm, premium and sales J, less entry........	14 60
1753.	Geo. J. Rust, premium and sales J, less entry........	6 83
1754.	Richard Kohlman, sales J, less entry.................	1 52
1755.	A. H. Knoke, premium and sales J....................	10 89
1756.	Frank Kleiner, premium and sales J..................	12 44
1757.	William Lindow, premium and sales J................	12 39
1758.	J. F. LeJenne, premium and sales J..................	2 40
1759.	Anton Loehr, premium and sales J, less entry.......	19 46
1760.	H. C. Lange, premium and sales J....................	6 55
1761.	J. B. Linzmeyer, premium and sales J, less entry....	5 31
1762.	Emil J. Lorenz, premium and sales J, less entry.....	1 28
1763.	M. M. Leick, premium and sales J, less entry........	8 07
1764.	Ed Maedke, premium and sales J......................	2 16
1765.	G. N. Matznick, premium and sales J................	7 86
1765.	Ed Wuensch, premium and sales J....................	36 17

No.	To whom paid.	Amount
1767.	A. B. Mayhew, premium and sales J, less entry......	18 79
1768.	Math Meyer, premium and sales J....................	37 39
1769.	Gottlieb Muehleisen, sales J..........................	5 54
1770.	W. Mortensen, premium and sales J................	32 89
1771.	Bert McKinney, premium J, less entry...............	6 55
1772.	F. J. McKoskey, premium and sales J, less entry....	6 01
1773.	W. F. Miller, premium and sales J, less entry........	2 69
1774.	R. W. Mossholder, premium and sales J, less entry..	3 34
1775.	Otto Mossholder, premium and sales J, less entry....	6 93
1776.	E. B. Mayhew, premium and sales L, less entry.....	4 08
1777.	H. W. Melchert, premium and sales J................	8 43
1778.	Jacob Marty, sales J..................................	30 24
1779.	J. F. Main, premium and sales J, less entry..........	41 44
1780.	D. B. Danielson, money advanced for labor..........	1,000 00
1781.	Robert Nauman, premium and sales J................	36 87
1782.	F. W. Nussbaumer, premium and sales J............	14 07
1783.	A. Nachtweg, premium and sales J, less entry........	4 52
1784.	A. J. Oleson, premium and sales J..................	9 79
1785.	William Ondernick, premium and sales J, less entry..	9 73
1786.	A. F. Peterson, premium and sales J................	11 58
1787.	N. E. Possley, premium and sales J, less entry.......	6 83
1788.	N. C. Paloski, sales J, less entry.....................	35
1789.	Chas. H. Patt, sales J, less entry....................	35
1790.	W. Papeham, premium and sales J, less entry........	8 07
1791.	H. W. Priebe, premium and sales J, less entry......	36 17
1792.	A. R. Radtke, premium and sales J..................	5 53
1793.	J. Rothenbach, sales J................................	1 30
1794.	F. W. Riedel, premium and sales J..................	23 21
1795.	N. L. Rapp, premium and sales J.....................	16 44
1796.	Chas. Rasmussen, sales J............................	3 29
1797.	R. H. Radke, premium and sale J, less entry........	4 50
1798.	Marcus Rappel, premium and sales J, less entry......	1 15
1799.	C. R. Schneider, sales J.............................	3 17
1800.	William Sy, Jr., premium and sales J................	7 42
1801.	H. A. Sonnabend, premium and sales J..............	24 27
1802.	E. O. Siggelkow, premium and sales J..............	19 30
1803.	A. J. Schulte, premium and sale J..................	23 09
1804.	Theo. W. Schreiber, premium and sales J............	21 29
1805.	William P. Sterns, premium and sales J............	3 59
1806.	E. A. Siggelkow, premium and sales J...............	18 81
1807.	Adam Schmelzer, premium and sales J, less entry....	11 51
1808.	R. H. Sample, sales J, less entry.....................	1 76
1809.	Henry Schneider, sales J, less entry..................	35
1810.	J. J. Stocker, premium and sales J, less entry........	6 68

No.	To whom paid.	Amount
1811.	H. A. Sterns, premium and sales J, less entry	6 31
1812.	O. R. Schwantes, premium and sales J, less entry	2 59
1813.	L. A. Schneider, premium and sales J, less entry	9 24
1814.	Aug. Sohrweide, sale J, less entry	28
1815.	F. Sette, premium and sales J	17 90
1816.	A. Schauf, premium and sales J, less entry	3 82
1817.	F. Seefeldt, premium and sales J, less entry	9 92
1818.	E. Termaat, sales J	2 35
1819.	J. A. Thiede, premium and sales J, less entry	6 43
1820.	F. Tisdale, premium and sales J	11 39
1821.	T. A. Uebbelohde, premium and sales J, less entry	11 94
1822.	Gottfried Vogel, premium and sales J	19 14
1823.	F. A. Viergutz, premium and sales J, less entry	38 78
1824.	J. A. Van Epps, premium and sales J, less entry	8 65
1825.	W. L. Walsh, premium and sales J	11 91
1826.	Aug. F. Westphal, premium and sales J	51 57
1827.	Emil Widder, premium and sales J	10 61
1828.	M. J. Wagner, premium and sales J, less entry	10 08
1829.	Lute Wooden, premium and sales J, less entry	9 85
1830.	J. L. Zehren, premium and sales J	15 72
1831.	William Zimmerman, premium and sales J	11 33
1832.	W. A. Zietlow, premium and sales J, less entry	10 78
1833.	Wauwatosa Stone Co., mdse	200 00
1834.	Geo. J. Schuster, balance premium B	16 00
1835.	R .H. Wilson, bill posting	17 65
1836.	W. B. Taylor, balance speed winnings	219 50
1837.	H. Raymond, wages September	50 00
1838.	B. L. Wentworth, salary September	60 00
1839.	John M. True, salary September	183 34
1840.	J. G. Boyd, balance premium A	9 00
1841.	John Gallagher Co., rent of tents	90 00
1842.	Smith-Blodgett Co., mdse	351 14
1843.	Wisconsin Telephone Co., services	6 20
1844.	E. C. Nielson, photographs	32 70
1845.	Garry Bouchard, labor	7 00
1846.	M. W. Sherman, advertising	12 50
1847.	Schwaab Stamp & Seal Co., mdse	30
1848.	C. W. Fischer Furniture Co., mdse	236 00
1849.	The Cogshall Co., mdse	7 20
1850.	Geo. Wylie, expenses	1 34
1851.	James J. Nelson, expenses	18 39
1852.	Geo. G. Cox, expenses	33 80
1853.	A. R. Ives, balance premium A	18 00
1854.	Mrs. Martin Dreyfus, balance premium M	2 00

No.	To whom paid.	Amount
1855.	A. H. Kittinger, balance premium E	3 25
1856.	William Korb, balance premium E	1 00
1857.	Mrs. R. B. Dobrogowski, balance premium E	3 00
1858.	Fountain City Poultry Yards, balance premium	1 00
1859.	A. C. Ellickson, overpaid entry	2 00
1860.	J. H. Pilgrim, premium J	11 30
1861.	Walter J. Wittich, balance premium L	5 00
1862.	T. M. E. R. & L. Co., services and material	2,202 63
	Total	$92,203 00

OCTOBER.

No.	To whom paid.	Amount
1863.	Julius Berg, premium J	$3 78
1864.	The Herold Co., advertising	100 00
1865.	Streissguth-Petran Co., balance on work	90
1866.	Fred Grimm, premium J	13 91
1867.	A. A. Freund, premium J	19 32
1868.	Fred Southcott, overpaid entry	4 00
1869.	Miss Dora Bunteschu, judging needle work	25 00
1870.	Mrs. Louise H. Bowerman, judging culinary div	25 00
1871.	Breeders' Gazette, advertising	75 00
1872.	Theo. Koss, mdse	1 25
1873.	James J. Nelson, expenses	17 74
1874.	Geo. Wylie, expenses	1 34
1875.	Geo. McKerrow, expenses and appropriation	45 98
1876.	A. H. Dahl, spurious coin	4 30
1877.	Columbia Publishing Co., advertising	15 00
1878.	F. D. Fulton, services Speed Department	73 00
1879.	D. W. Watt, services Speed Department	23 20
1880.	Thos. Dunbar, services Speed Department	10 50
1881.	Evening Wisconsin, advertising privileges	3 36
1882.	A. LeFeber, grain and feed	630 88
1883.	O. F. Roessler, expenses and appropriation	64 18
1884.	W. U. Telegraph Co., messages, state fair	5 07
1885.	Wis. Telephone Co., telephone rent	10 50
1886.	H. L. Mower, labor	137 00
1887.	Louis Mayer, judging art	50 00
1888.	Chas. Miller, labor	42 80
1889.	Geo. DeBruine, labor	74 42
1890.	Chas. Rapp, labor	33 60
1891.	Herman Jaeger, labor	33 60
1892.	C. A. Brown, labor	32 00
1893.	F. H. Marvin, labor	15 05
1894.	William Kenney, labor	38 67

No.	To whom paid.	Amount
1895.	E. M. Shaw, labor	34 91
1896.	John Stone, labor	19 25
1897.	Garry Wolf, labor	31 50
1898.	Dick Walsh, labor	8 40
1899.	John Miller, labor	13 50
1900.	Chas. Barnekow, labor	9 00
1901.	Peter Shetter, labor	77 97
1902.	Frank Mayo, labor	22 75
1903.	I. J. Terry, labor	5 25
1904.	John Hartzell, labor	14 00
1905.	Ben Gridley, labor	18 00
1906.	The Bill Board Publishing Co., subscription	4 00
1907.	Profitable Poultry, advertising	5 00
1909.	Great Western Circuit, assessment 1908	69 00
1909.	Wadhams Oil Co., mdse	8 50
1910.	C. T. Fisher, Supt. Forage & Trans	75 00
1911.	J. Raymond, hay and straw	54 90
1912.	George Wolff, hay and straw	58 10
1913.	John J. Kuhn, overpaid entry	2 00
1914.	J. J. Pecher, bill posting	45 00
1915.	Horseman Newspaper Co., advertising	16 24
1916.	Math Michels, express charges paid	3 10
1917.	B. L. Wentworth, salary October	60 00
1918.	John M. True, salary October	183 33
1919.	Chas. Liebenthal, blacksmithing	47 75
1920.	Smith-Blodgett Co., mdse	1 05
1921.	Wis. Telephone Co., services on fair grounds	202 70
1922.	Gimbel Bros., mdse	234 72
1923.	A. LeFeber grain and straw	59 06
1924.	Henry Leitske, wagon tires	3 00
1925.	F. E. Walsh, mdse	10 75
1926.	Streissguth-Petran Co., mdse	11 90
1927.	G. U. Fisher, expenses and appropriation	164 41
1928.	C. A. Brown wages, October	50 00
1929.	C. S. Hechtner, balance premium B	14 00
1930.	The Morawetz Co., mdse	20 00
	Total	$3,279 27

NOVEMBER.

No.	To whom paid.	Amount
1931.	E. E. Hull, subscriptions to dailies	$3 80
1932.	H. W. Austin, entry (overpaid)	2 00
1933.	Ed. Nordman, expenses	16 48
1934.	Geo. McKerrow, expenses	3 69

No.	To whom paid.	Amount
1935.	Ed. Nordman, expenses, (meeting Aug. 7)...........	16 22
1936.	O. F. Roessler, expenses............................	2 83
1937.	L. E. Scott, expenses.............................	12 84
1938.	J. L. Herbst, expenses............................	8 82
1939.	James J. Nelson, expenses.........................	17 44
1940.	D. B. Danielson, services fair grounds improvements	1,135 38
1941.	Independent Oil & Grease Co., mdse.................	15 60
1942.	F. C. Jirachek, harness repairs......................	3 60
1943.	Rundle-Spence Mfg. Co. mdse.........................	42 32
1944.	Chas. O. Korn, work and material on coops..........	94 30
1945.	Rambler Garage Co., use of auto.....................	7 00
1946.	William Korb, feed and coops rented................	31 75
1947.	Chas. Miller, labor..................................	49 40
1948.	Herman Jaeger, labor................................	28 70
1949.	Richard Walsh, labor................................	3 32
1950.	Peter Schetter, labor................................	4 50
1951.	Pritzlaff Bros., mdse................................	58 71
1952.	Void.	
1953.	William Wolff, baling hay...........................	20 25
1954.	B. L. Wentworth, salary November...................	60 00
1955.	John M. True, salary, November.....................	183 33
1956.	C. A. Brown, wages, November.......................	59 00
1957.	F. E. Walsh, balance on mdse........................	11 75
1958.	C. W. Fischer Furniture Co., balance on mdse......	82 00
	Total	$1,966 65

DECEMBER.

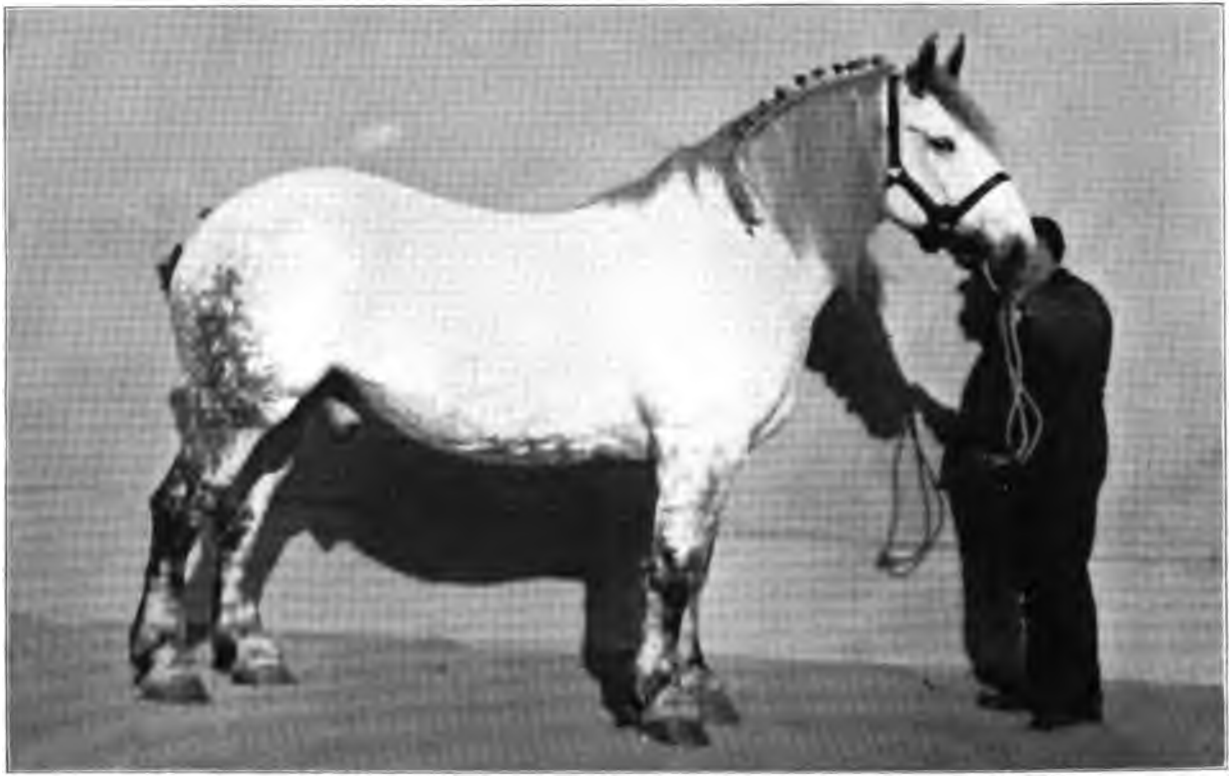
1959.	Wisconsin Equity News, advertising, 1908...........	$10 00
1960.	John M. True, expenses Chicago meeting.............	9 55
1961.	Pritzlaff Bros., mdse................................	22 12
1962.	John M. True, payment December salary............	33 34
1963.	Geo. Wylie, expenses Chicago meeting...............	14 69
1964.	Geo. McKerrow, expenses Chicago meeting..........	11 20
1965.	L. E. Scott, expenses Chicago meeting...............	23 95
1966.	John M. True, balance December salary..............	150 00
1967.	B. L. Wentworth, salary, December.................	60 00
1968.	C. A. Brown, wages December......................	50 00
1969.	Wisconsin Telephone Co., services..................	9 00
	Total	$393 85

JANUARY—1909.

No.	To whom paid.	Amount
1970.	Eugene J. Hall, photographs	$7 00
1971.	John M. True, payment on January salary	33 33
1972.	B. L. Wentworth, salary January	60 00
1973.	John M. True, balance salary January	150 00
	Total	$250 33

FEBRUARY.

No.	To whom paid.	Amount
1974.	C. A. Brown, wages, January	$50 00
1975.	W. L. Houser, convention expenses	10 00
1976.	Geo. G. Cox, expenses	7 35
1977.	David Wedgwood, for making report	10 00
1978.	O'Neil Oil & Paint Co., mdse	12 00
1979.	A. LeFeber, grain	50 50
1980.	C. G. Wilcox, expenses, Western Circuit Mtg	15 10
1981.	Dr. R. A. Sullivan, services	3 50
1982.	Wisconsin Telephone Co. rental	12 00
1983.	Russell-Porter Hardware Co., mdse	6 30
1984.	C. F. Nobles, boarding help, state fair	46 50
1985.	Mrs. Norah E. R. Perkins, over-payment	3 00
1986.	C. H. Eckles, convention expenses	50 00
1987.	W. F. Stiles, convention expenses	1 40
1988.	H. H. Wing, convention expenses	42 45
1989.	George C. Hill, convention expenses	7 75
1990.	W. A. McKerrow, convention expenses	6 50
1991.	John M. True, payment on February salary	33 33
1992.	C. A. Brown, wages, February	50 00
1993.	B. L. Wentworth, salary February	60 00
1994.	John M. True, balance salary February	150 00
	Total	$627 68



"Jim"—the World's Champion Gelding.
Owned by Armour Co.—Chicago.

AWARD OF PREMIUMS OF STATE FAIR, 1908.

HORSES.

Judges.

W. E. Prichard, Ottawa, Ill.
Prof. C. F. Curtiss, Ames, Ia.
Arthur Stericker, Sycamore, Ill.

PERCHERON AND FRENCH DRAFT.

Open Class.

Stallion 4 years old or over.

1st Prem., Robert Burgess & Son, Wenina, Ill	$25 00
2nd Prem., Ethelwold Farms, Mondovi, Wis	20 00
3rd Prem., Taylor & Jones, Williamsville, Ill	10 00

Stallion 3 years and under 4.

1st Prem., Taylor & Jones	$25 00
2nd Prem., Robert Burgess & Son	20 00
3rd Prem., James B. Boyd, Milwaukee Wis	10 00

Stallion 2 years and under 3.

1st Prem., Robert Burgess & Son	$20 00
2nd Prem., Robert Burgess & Son	15 00
3rd Prem., Robert Burgess & Son	7 00

Stallion 1 year and under 2.

1st Prem., Robert Burgess & Son	$20 00
2nd Prem., Robert Burgess & Son	15 00
3rd Prem., Taylor & Jones	7 00

Stallion foal.

1st Prem., Lewis Lewellin & Sons, Waterloo, Wis	$15 00
2nd Prem., Lewis Lewellin & Sons	10 00
3rd Prem., G. N. Mihills, Fond du Lac, Wis	5 00

Mare 4 years old or over.

1st Prem., Robert Burgess & Son	$25 00
2nd Prem., Robert Burgess & Son	20 00
3rd Prem., Lewis Lewellin & Sons	10 00

Mare 3 years and under 4.

1st Prem., Robert Burgess & Son	$20 00
2nd Prem., Robert Burgess & Son	15 00
3rd Prem., Lewis Lewellin & Sons	7 00

Mare 2 years and under 3.

1st Prem., Ethelwold Farms	$20 00
2nd Prem., Louis Lewellin & Sons	15 00
3rd Prem., James G. Boyd	7 00

Mare 1 year and under 2.

1st Prem., Robert Burgess & Son	$15 00
2nd Prem., James G. Boyd	10 00
3rd Prem., A. R. Ives, Delavan, Wis	5 00

Filly foal.

1st Prem., A. R. Ives	$15 00
2nd Prem., G. N. Mihills	10 00
3rd Prem., Lewis Lewellin & Sons	5 00

Get of sire.

1st Prem., Robert Burgess & Son	$30 00
2nd Prem., G. N. Mihills	20 00

Produce of dam.

1st Prem., Robert Burgess & Son	$20 00
2nd Prem., Ethelwold Farms	15 00

Horses Bred and Owned in Wisconsin.

Stallion 4 years old or over.

1st Prem., James G. Boyd	$25 00
2nd Prem., G. N. Mihills	20 00
3rd Prem., Fox Bros., Waukesha, Wis	10 00

Stallion 3 years and under 4.

1st Prem., James G. Boyd	$25 00
2nd Prem., G. N. Mihills	20 00

Stallion 2 years and under 3.

1st Prem., G. N. Mihills	$20 00
2nd Prem., G. N. Mihills	15 00
3rd Prem., A. R. Ives	7 00

Stallion 1 year and under 2.

1st Prem., Ethelwold Farms	$20 00
2nd Prem., G. N. Mihills	15 00

Stallion foal.

1st Prem., Lewis Lewellin & Sons	$15 00
2nd Prem., G. N. Mihills	10 00
3rd Prem., Lewis Lewellin & Sons	5 00

Mare 4 years old or over.

1st Prem., James G. Boyd	$25 00
2nd Prem., Lewis Lewellin & Sons	20 00
3rd Prem., G. N. Mihills	10 00

Mare 3 years and under 4.

1st Prem., Lewis Lewellin & Sons	$20 00
2nd Prem., James G. Boyd	15 00
3rd Prem., Lewis Lewellin & Sons	7 00

Mare 2 years and under 3.

1st Prem., Ethelwold Farms	$20 00
2nd Prem., Lewis Lewellin & Sons	15 00
3rd Prem., James G. Boyd	7 00

Mare 1 year and under 2.

1st Prem., James G. Boyd	$15 00
2nd Prem., A. R. Ives	10 00
3rd Prem., James G. Boyd	5 00

Filly foal.

1st Prem., A. R. Ives	$15 00
2nd Prem., G. N. Mihills	10 00
3rd Prem., Lewis Lewellin & Sons	5 00

Get of sire.

1st Prem., G. N. Mihills	$30 00
2nd Prem., Lewis Lewellin & Sons	20 00

Produce of dam.

1st Prem., Ethelwold Farms	$20 00
2nd Prem., Lewis Lewellin & Sons	15 00

Sweepstakes—Percheron Classes.

Best stallion any age, Taylor & Jones	$30 00
Best mare any age, Robert Burgess & Son	20 00

SPECIAL PRIZES.

Percheron Society of America.

American Bred stallion any age.

1st Prem., Taylor & Jones	Gold Medal
2nd Prem., Robert Burgess & Son	Ribbon

American Bred mare any age.

1st Prem., Robert Burgess & Son	Gold Medal
2nd Prem., Ethelwold Farms	Ribbon

Champion stallion.

1st Prem., Taylor & Jones	Gold Medal
2nd Prem., Robert Burgess & Son	Ribbon

Champion mare.

1st Prem., Robert Burgess & Son	Gold Medal
2nd Prem., Ethelwold Farms	Ribbon

Best five stallions.

1st Prem., Robert Burgess & Son	Gold Medal
2nd Prem., Taylor & Jones	Ribbon

Best three mares.

1st Prem., Robert Burgess & Son	Gold Medal
2nd Prem., Lewis Lewellin & Sons	Ribbon

Five American Bred stallions.

1st Prem., Taylor & Jones	Gold Medal
2nd Prem., James G. Boyd	Ribbon

Three American Bred mares.

1st Prem., Robert Burgess & Son	Gold Medal
2nd Prem., James G. Boyd	Ribbon

Stud—stallion and four mares.

1st Prem., Robert Burgess & Son	Champion Cup
2nd Prem., James G. Boyd	Diploma

Get of one sire.

Premium, Robert Burgess & Son	$50 00

Produce of one mare.

Premium, Robert Burgess & Son	$50 00

Stallion—bred by exhibitor.

Premium, Robert Burgess & Son	$50 00

Mare—bred by exhibitor.

Premium, Robert Burgess & Son	$50 00

CLYDESDALE.

Open Class.

Stallion 4 years old or over.

1st Prem., Alex Galbraith & Son, Janesville, Wis	$25 00
2nd Prem., Alex Galbraith & Son	20 00
3rd Prem., Alex Galbraith & Son	10 00

Stallion 3 years and under 4.

1st Prem., Alex Galbraith & Son	$25 00
2nd Prem., Alex Galbraith & Son	20 00
3rd Prem., Alex Galbraith & Son	10 00

Stallion 2 years and under 3.

1st Prem., Alex Galbraith & Son	$20 00
2nd Prem., Alex Galbraith & Son	15 00
3rd Prem., McLay Bros., Janesville, Wis	7 00

Stallion 1 year and under 2.

1st Prem., McLay Bros	$20 00
2nd Prem., Ethelwold Farms, Mondovi, Wis	15 00
3rd Prem., Alex Galbraith & Son	7 00

Stallion foal.

1st Prem., McLay Bros	$15 00
2nd Prem., McLay Bros	10 00

Mare 4 years old or over.

1st Prem., McLay Bros	$25 00
2nd Prem., McLay Bros	20 00
3rd Prem.. McLay Bros	10 00

Mare 2 years and under 3.

1st Prem., McLay Bros	$20 00
2nd Prem., Alex Galbraith & Son	15 00

Mare 1 year and under 2.

1st Prem., Ethelwold Farms	$15 00
2nd Prem., Ethelwold Farms	10 00

Filly foal.

1st Prem., McLay Bros	$15 00

Get of sire.

1st Prem., Ethelwold Farms	$30 00
2nd Prem., McLay Bros	20 00

Produce of dam.

1st Prem., McLay Bros	$20 00
2nd Prem., Ethelwold Farms	15 00

Horses Bred and Owned in Wisconsin.

Stallion 3 years and under 4.

1st Prem., Ethelwold Farms	$25 00

Stallion 2 years and under 3.

1st Prem., McLay Bros	$20 00
2nd Prem., McLay Bros	15 00
3rd Prem., C. M. Mason, Edgerton, Wis	7 00

Stallion 1 year and under 2.

1st Prem., McLay Bros	$20 00
2nd Prem., Ethelwold Farms	15 00
3rd Prem., Alex Galbraith & Son	7 00

Stallion foal.

1st Prem., McLay Bros	$15 00
2nd Prem., McLay Bros	10 00

Mare 4 years old or over.

1st Prem., McLay Bros	$25 00
2nd Prem., McLay Bros	20 00
3rd Prem., McLay Bros	10 00

Mare 2 years and under 3.

1st Prem., McLay Bros	$20 00

Mare 1 year and under 2.

1st Prem., Ethelwold Farms	$15 00
2nd Prem., Ethelwold Farms	10 00

Filly foal.

1st Prem., McLay Bros	$15 00

Get of sire.

1st Prem., Ethelwold Farms	$30 00
2nd Prem., McLay Bros	20 00

Produce of dam.

1st Prem., McLay Bros	$20 00
2nd Prem., Ethelwold Farms	15 00

Sweepstakes—Clydesdale Classes.

Best stallion any age, Alex Galbraith & Son	$30 00
Best mare any age, McLay Bros	20 00

Special Prizes.

Stallion 3 years old or over.

1st Prem., Alex Galbraith & Son	$24 00
2nd Prem., Alex Galbraith & Son	16 00
3rd Prem., Alex Galbraith & Son	10 00

Mare 3 years old or over.

1st Prem., McLay Bros	$24 00
2nd Prem., McLay Bros	16 00
3rd Prem., McLay Bros	10 00

Stallion under 3 years.

1st Prem., Alex Galbraith & Son	$24 00
2nd Prem., Alex Galbraith & Son	16 00
3rd Prem., McLay Bros	10 00

Mare under 3 years.

1st Prem., McLay Bros	$24 00
2nd Prem., Ethelwold Farms	16 00
3rd Prem., Alex Galbraith & Son	10 00

ENGLISH SHIRE.

Stallion 4 years old or over.

1st Prem., Taylor & Jones, Williamsville, Ill	$25 00
2nd Prem., Robert Burgess & Son, Wenona, Ill	20 00
3rd Prem., Finch Bros., Joliet, Ill	10 00

Stallion 3 years and under 4.

1st Prem., Finch Bros	$25 00
2nd Prem., Taylor & Jones	20 00

Mare 3 years and under 4.

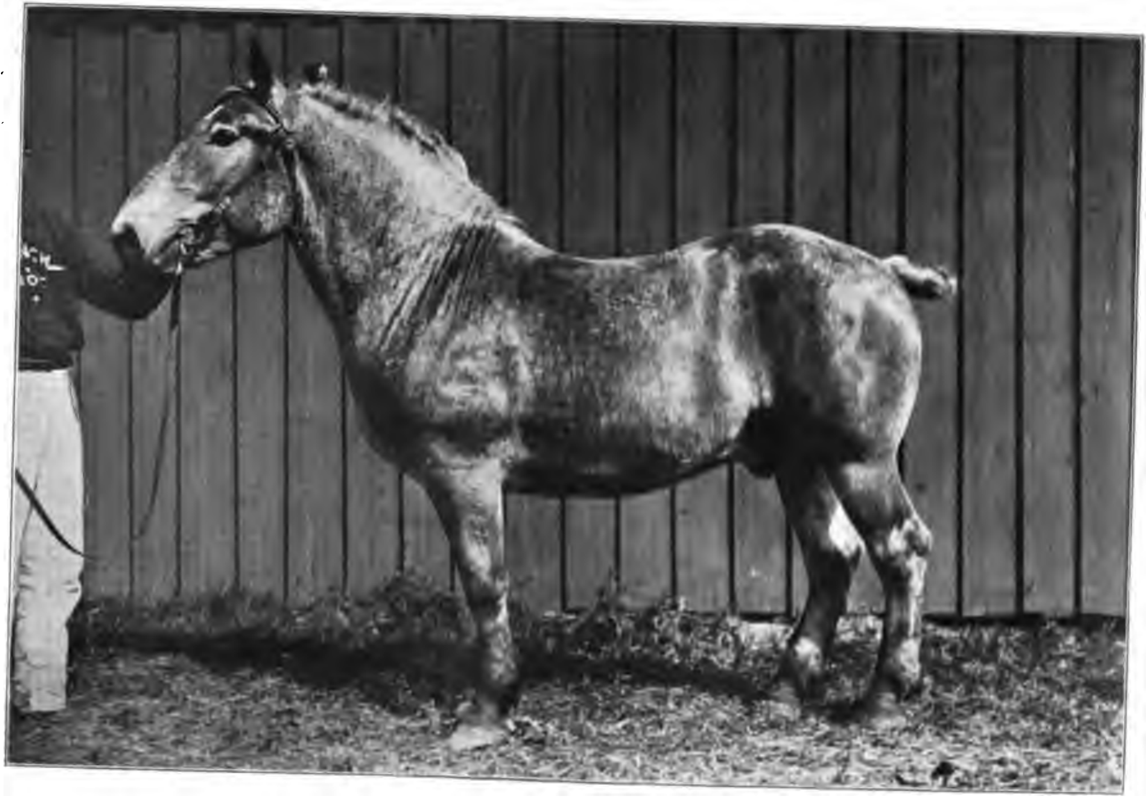
1st Prem., Finch Bros	$25 00

Mare 2 years and under 3.

1st Prem., Finch Bros	$20 00

Mare 1 year and under 2.

1st Prem., Finch Bros	$15 00



Belgian Stallion.

Get of sire.

1st Prem., Finch Bros	$30 00

Produce of dam.

1st Prem., Finch Bros	$20 00

Sweepstakes.

Best stallion any age, Taylor & Jones	$30 00
Best mare any age, Finch Bros	20 00

The two Gold Medals offered by the Shire Horse Society of England were awarded as follows:

Best stallion any age	Taylor & Jones
Best mare any age	Finch Bros.

Stallion 4 years old or over.

BELGIAN AND OTHER FRENCH DRAFT.

1st Prem., Taylor & Jones	$25 00
2nd Prem., Finch Bros	20 00
3rd Prem., Finch Bros	10 00

Stallion 3 years and under 4.

1st Prem., Finch Bros	$25 00
2nd Prem., Taylor & Jones	20 00
3rd Prem., Finch Bros	10 00

Stallion 2 years and under 3.

1st Prem., Taylor & Jones	$20 00
2nd Prem., Finch Bros	15 00
3rd Prem., Finch Bros	7 00

Mare 2 years and under 3.

1st Prem., Finch Bros	$20 00

Get of sire.

1st Prem., Finch Bros	$30 00

Produce of dam.

1st Prem., Finch Bros	$20 00

Sweepstakes.

Best stallion any age, Taylor & Jones	$30 00
Best mare any age, Finch Bros	20 00

The special prizes offered by the American Association of Belgian Draft Horse Breeders were awarded as follows:

Champion stallion any age.

1st Prem., Taylor & Jones	Gold Medal
2nd Prem., Finch Bros	Reserve Ribbon

Champion mare any age.

1st Prem., Finch Bros	Gold Medal

ENGLISH, GERMAN AND FRENCH COACH HORSES.

Stallion 4 years old or over.

1st Prem., Pabst Stock Farm, Oconomowoc, Wis	$25 00
2nd Prem., Alex Galbraith & Son	20 00
3rd Prem., A. R. Ives, Delavan, Wis	10 00

Stallion 2 years and under 3.

em., Pabst Stock Farm	$20 00
2nd Prem., Taylor & Jones	15 00

Stallion foal.

1st Prem., Pabst Stock Farm	$15 00

Mare 4 years old or over.

1st Prem., Pabst Stock Farm	$25 00

Mare 3 years and under 4.

1st Prem., Pabst Stock Farm	$20 00

Mare 2 years and under 3.

1st Prem., Pabst Stock Farm	$20 00
2nd Prem., Pabst Stock Farm	15 00
3rd Prem., A. R. Ives	7 00

Mare 1 year and under 2.

1st Prem., Pabst Stock Farm	$15 00
2nd Prem., Pabst Stock Farm	10 00
3rd Prem., A. R. Ives	7 00

Filly foal.

1st Prem., Pabst Stock Farm	$15 00

Get of sire.

1st Prem., Robert Hardy, Waukesha, Wis	$30 00

Produce of dam.

1st Prem., A. R. Ives	$20 00

Sweepstakes.

Best stallion any age, Pabst Stock Farm	$30 00

The Silver Medals offered by the English Hackney Society of England were awarded as follows:

Best Hackney stallion any age	Pabst Stock Farm
Best Hackney mare any age	Pabst Stock Farm

AMERICAN CARRIAGE HORSES.

Stallion 4 years old or over.

1st Prem., Progress Blue Ribbon Farms, Waukesha, Wis	$25 00
2nd Prem., J. McD. Randles, Waukesha, Wis	20 00

Stallion 3 years and under 4.

1st Prem., R. S. Witte, Waukesha, Wis	$25 00

Stallion 2 years and under 3.

2nd Prem., J. C. Land, Waukesha, Wis	$15 00

Mare 4 years old or over.

1st Prem., Ethelwold Farms, Mondovi, Wis	$25 00

Mare and foal.

1st Prem., John T. Edwards, Waukesha, Wis	$20 00

Foal under 1 year.

1st Prem., John T. Edwards	$15 00
2nd Prem., McD. Randles	10 00

Sweepstakes.

Best stallion any age, Progress Blue Ribbon Farms	$30 00
Best mare any age, Ethelwold Farms	20 00

STANDARD BRED AND REGISTERED TROTTING HORSES.

Stallion 4 years old or over.

1st Prem., Uihlein Bros., Milwaukee, Wis	$25 00
2nd Prem., Progress Blue Ribbon Farms	20 00
3rd Prem., Uihlen Bros	10 00

Stallion 3 years and under 4.

1st Prem., Uihlein Bros	$25 00
2nd Prem., Uihlein Bros	20 00
3rd Prem., R. S. Witte	10 00

Stallion 2 years and under 3.

1st Prem., Uihlein Bros	$20 00
2nd Prem., J. C. Land	15 00

Stallion 1 year and under 2.

1st Prem., Uihlein Bros	$20 00
2nd Prem., J. C. Land	15 00

Stallion foal.

1st Prem., Uihlein Bros	$15 00

Mare 4 years old or over.

1st Prem., Uihlein Bros	$25 00
2nd Prem., Uihlein Bros	20 00
3rd Prem., Ethelwold Farms	10 00

Mare 3 years and under 4.

1st Prem., Uihlein Bros	$20 00

Mare 2 years and under 3.

1st Prem., Uihlein Bros	$20 00
2nd Prem., Ethelwold Farms	15 00

Mare 1 year and under 2.

1st Prem., Uihlein Bros	$15 00

Filly foal.

1st Prem., Uihlein Bros	$15 00
2nd Prem., J. McD. Randles	10 00
3rd Prem., J. C. Land	5 00

Get of sire.

1st Prem., Uihlein Bros	$30 00
2nd Prem., J. C. Land	20 00

Produce of dam.

1st Prem., Uihlein Bros	$20 00
2nd Prem., J. C. Land	15 00

Sweepstakes.

Best stallion any age, A. E. Rundles, Livingston, Wis	$30 00
Best mare any age, Uihlein Bros	20 00

HEAVY DRAFT TEAMS.

Best 2 horse team.

1st Prem., Robert Burgess & Son	$40 00
2nd Prem., McLay Bros	20 00
3rd Prem., Lewis Lewellin & Sons, Waterloo, Wis	10 00

GAITED SADDLE HORSES.

Best saddle horse over 15½ hands.

1st Prem., Hans Berg, Milwaukee, Wis	$25 00
2nd Prem., Hans Berg	20 00
3rd Prem., Hans Berg	15 00
4th Prem., J. H. Greene & Son, Clinton, Wis	10 00

Best saddle horse over 14½ hands and under 15½ hands.

1st Prem., Hans Berg	$25 00
2nd Prem., Mrs. John T. Unertl, Milwaukee, Wis	20 00
3rd Prem., Mrs. F. Luedke, Milwaukee, Wis	15 00
4th Prem., Dr. David Roberts, Waukesha, Wis	10 00

Best saddle pony under 14½ hands.

1st Prem., Pabst Stock Farm, Oconomowoc, Wis	$25 00
2nd Prem., T. S. Simpson & Sons, Evanston, Ill	20 00
3rd Prem., T. S. Simpson & Sons	15 00
4th Prem., Dr. David Roberts	10 00

EQUESTRIANISM.

Boy rider under 15 years.

1st Prem., Roy Southcott, Wauwatosa, Wis	$25 00
2nd Prem., Arthur Ott, West Allis, Wis	15 00
3rd Prem., Walter Harnischfeger, Milwaukee, Wis	10 00

Girl rider under 15 years.

1st Prem	$25 00
2nd Prem	15 00
3rd Prem., Gladys Nolte, Milwaukee, Wis	10 00

Lady rider.

1st Prem., Mrs. John T. Unertl, Milwaukee, Wis	$25 00
2nd Prem	15 00
3rd Prem	10 00

Gentleman rider.

1st Prem., Pabst Stock Farm, Oconomowoc, Wis	$25 00
2nd Prem., Hans Berg, Milwaukee, Wis	15 00
3rd Prem., Arthur Ott, West Allis, Wis	10 00

HARNESS HORSES—MARE OR GELDING.

Best pair 15¾ hands or over.

1st Prem., John T. Edwards, Waukesha, Wis	$25 00

Best pair 15 hands and under 15¾ hands.

2nd Prem., John T. Edwards	$20 00

Best single animal 15¾ hands.

1st Prem., J. H. Greene & Son, Clinton, Wis	$20 00
2nd Prem., Fox Bros., Waukesha, Wis	15 00
3rd Prem., John T. Edwards	10 00
4th Prem., Lewis Roberts, Waukesha, Wis	5 00

SHETLAND PONIES.

Stallion 4 years old or over.

1st Prem., T. S. Simpson & Sons, Evanston, Ill.	$15 00
2nd Prem., Geo. H. Simpson, Wheaton, Ill.	10 00
3rd Prem., T. S. Simpson & Sons	5 00

Stallion 3 years and under 4.

1st Prem., Geo. H. Simpson	$15 00
2nd Prem., Logan W. Black, Jacksonville, Ill.	10 00

Stallion 2 years and under 3

1st Prem., T. S. Simpson & Sons	$15 00
2nd Prem., Geo. H. Simpson	10 00

Stallion 1 year and under 2.

1st Prem., Logan W. Black	$15 00
2nd Prem., Logan W. Black	10 00
3rd Prem., T. S. Simpson & Sons	5 00

Stallion colt under 1 year.

1st Prem., Logan W. Black	$15 00
2nd Prem., T. S. Simpson & Sons	10 00
3rd Prem., Logan W. Black	5 00

Mare 4 years old or over.

1st Prem., Logan W. Black	$15 00
2nd Prem., T. S. Simpson & Sons	10 00
3rd Prem., T. S. Simpson & Sons	5 00

Mare 3 years and under 4.

1st Prem., Geo. H. Simpson	$15 00
2nd Prem., Logan W. Black	10 00
3rd Prem., Logan W. Black	5 00

Mare 2 years and under 3.

1st Prem., Logan W. Black	$15 00
2nd Prem., Logan W. Black	10 00
3rd Prem., T. S. Simpson & Sons	5 00

Mare 1 year and under 2.

1st Prem., Geo. H. Simpson	$15 00
2nd Prem., Logan W. Black	10 00
3rd Prem., Logan W. Black	5 00

Mare colt under 1 year.

1st Prem., T. S. Simpson & Sons	$15 00
2nd Prem., Logan W. Black	10 00
3rd Prem., Geo. H. Simpson	5 00

Pony in harness.

1st Prem., T. S. Simpson & Sons	$20 00
2nd Prem., T. S. Simpson & Sons	15 00
3rd Prem., T. S. Simpson & Sons	10 00

Tandem.

1st Prem., T. S. Simpson & Sons	$20 00
2nd Prem., Logan W. Black	15 00
3rd Prem., T. S. Simpson & Sons	10 00

Four-in-hand.

1st Prem., T. S. Simpson & Sons	$20 00
2nd Prem., Logan W. Black	15 00
3rd Prem., Geo. H. Simpson	10 00

Matched team.

1st Prem., T. S. Simpson & Sons	$20 00
2nd Prem., Logan W. Black	15 00
3rd Prem., Geo. H. Simpson	10 00

Saddle pony.

1st Prem., T. S. Simpson & Sons	$15 00
2nd Prem., T. S. Simpson & Sons	10 00
3rd Prem., Geo. H. Simpson	5 00

Champion Stallion or mare.

T. S. Simpson & Sons	$20 00

FARMERS' DIVISION.

Grade Draft.

Brood mare with foal at foot.

1st Prem., Lewis Roberts, Waukesha, Wis	$20 00
2nd Prem., Geo. F. Carroll, Waukesha, Wis	15 00
3rd Prem., Sleep Bros., Waukesha, Wis	5 00

Mare or gelding 3 years old or over.

1st Prem., Sleep Bros	$15 00
2nd Prem., Geo. F. Carroll	10 00
3rd Prem., Geo. F. Carroll	5 00

Mare or gelding 2 years and under 3.

1st Prem., Sleep Bros	$15 00
2nd Prem., Sleep Bros	10 00
3rd Prem., Sleep Bros	5 00

Mare or gelding 1 year and under 2.

1st Prem., R. S. Witte, Waukesha, Wis	$10 00
2nd Prem., Sleep Bros	7 00

Foal.

1st Prem., Lewis Roberts	$10 00
2nd Prem., Sleep Bros	7 00
3rd Prem., Geo. F. Carroll	4 00

Grade draft farm team.

1st Prem., Sleep Bros	$25 00

Team of chunks.

1st Prem., Geo. F. Carroll	$25 00
2nd Prem., Sleep Bros	15 00

Grade Coachers.

Brood mare with foal at side.

1st Prem., John T. Edwards	$20 00
2nd Prem., Hardy & Bradley, Waukesha, Wis	15 00
3rd Prem., Hardy & Bradley	5 00

Mare or gelding 3 years old or over.

1st Prem., Fred Southcott, Wauwautosa, Wis	$15 00
2nd Prem., Henry Tennessen, Menomonee Falls, Wis	10 00
3rd Prem., J. McD. Randles, Waukesha, Wis	5 00

Mare or gelding 2 years and under 3.

1st Prem., Hardy & Bradley	$15 00
2nd Prem., Henry Tennessen	10 00
3rd Prem., Hardy & Bradley	5 00

Mare or gelding 1 year and under 2.

1st Prem., Hardy & Bradley	$10 00
2nd Prem., Hardy & Bradley	7 00
3rd Prem., John T. Edwards	4 00

Foal.

1st Prem., Hardy & Bradley	$10 00
2nd Prem., John T. Edwards	7 00
3rd Prem., Hardy & Bradley	4 00

Non-Registered Roadsters.

Brood mare with foal at side.

1st Prem., R. S. Witte	$20 00
2nd Prem., Fox Bros., Waukesha, Wis	15 00
3rd Prem., J. C. Land, Waukesha, Wis	5 00

Mare or gelding 3 years old or over.

1st Prem., Fred Southcott	$15 00
2nd Prem., Dr. David Roberts, Waukesha, Wis	10 00
3rd Prem., Geo. F. Carroll	5 00

Mare or gelding 2 years and under 3.

1st Prem., Geo. F. Carroll	$15 00
2nd Prem., Sleep Bros	10 00
3rd Prem., R. S. Witte	5 00

Mare or gelding 1 year and under 2.

1st Prem., R. S. Witte	$10 00
2nd Prem., John T. Edwards	7 00

Foal.

1st Prem., R. S. Witte	$10 00
2nd Prem., Fox Bros	7 00
3rd Prem., J. C. Land	4 00

Jacks and Mules.

Best jack 2 years old or over.

1st Prem., J. McD. Randles, Waukesha Wis	$15 00

Best jack under 2 years.

1st Prem., J. McD. Randles	$12 00

Best pair of mules.

1st Prem., J. McD. Randles	$15 00

Best single mule 2 years old or over.

1st Prem., J. McD. Randles	$10 00

SPECIAL PREMIUMS.

Percheron and French Draft.

Stallion 3 years old or over.

1st Prem., Ethelwold Farms, Mondovi, Wis	$25 00
2nd Prem., James G. Boyd, Milwaukee, Wis	20 00
3rd Prem., A. E. Rundell, Livingston, Wis	10 00

Stallion 2 years and under 3.

1st Prem., James G. Boyd	$25 00
2nd Prem., G. N. Mihills, Fond du Lac, Wis	20 00
3rd Prem., A. R. Ives, Delavan, Wis	10 00

Stallion 1 year and under 2.

1st Prem., Ethelwood Farms	$15 00
2nd Prem., G. N. Mihills	10 00

Mare 3 years old or over.

1st Prem., Lewis Lewellin & Sons, Waterloo, Wis	$20 00
2nd Prem., James G. Boyd	15 00
3rd Prem., A. R. Ives	5 00

Mare 2 years and under 3.

1st Prem., Ethelwold Farms	$15 00
2nd Prem., James G. Boyd	10 00
3rd Prem., Lewis Lewellin & Sons	5 00

Mare 1 year and under 2.

1st Prem.,	James G. Boyd	$15 00
2nd Prem.,	A. R. Ives	10 00
3rd Prem.,	Lewis Lewillin & Sons	5 00

Foal under 1 year.

1st Prem.,	A. R. Ives	$10 00
2nd Prem.,	Fred Southcott	5 00
3rd Prem.,	Lewis Lewellin & Sons	3 00

Clydesdale and Shire.

Stallion 3 years old or over.

1st Prem.,	Alex Galbraith & Son, Janesville, Wis	$25 00
2nd Prem.,	Alex Galbraith & Son	20 00
3rd Prem.,	Alex Galbraith & Son	10 00

Stallion 2 years and under 3.

1st Prem.,	Alex Galbraith & Son	$25 00
2nd Prem.,	Alex Galbraith & Son	20 00
3rd Prem.,	McLay Bros., Janesville, Wis	10 00

Stallion 1 year and under 2.

1st Prem.,	McLay Bros	$15 00
2nd Prem.,	Ethelwold Farms	10 00
3rd Prem.,	Alex Galbraith & Son	5 00

Mare 3 years old or over.

1st Prem.,	McLay Bros	$20 00
2nd Prem.,	McLay Bros	15 00
3rd Prem.,	McLay Bros	5 00

Mare 2 years and under 3.

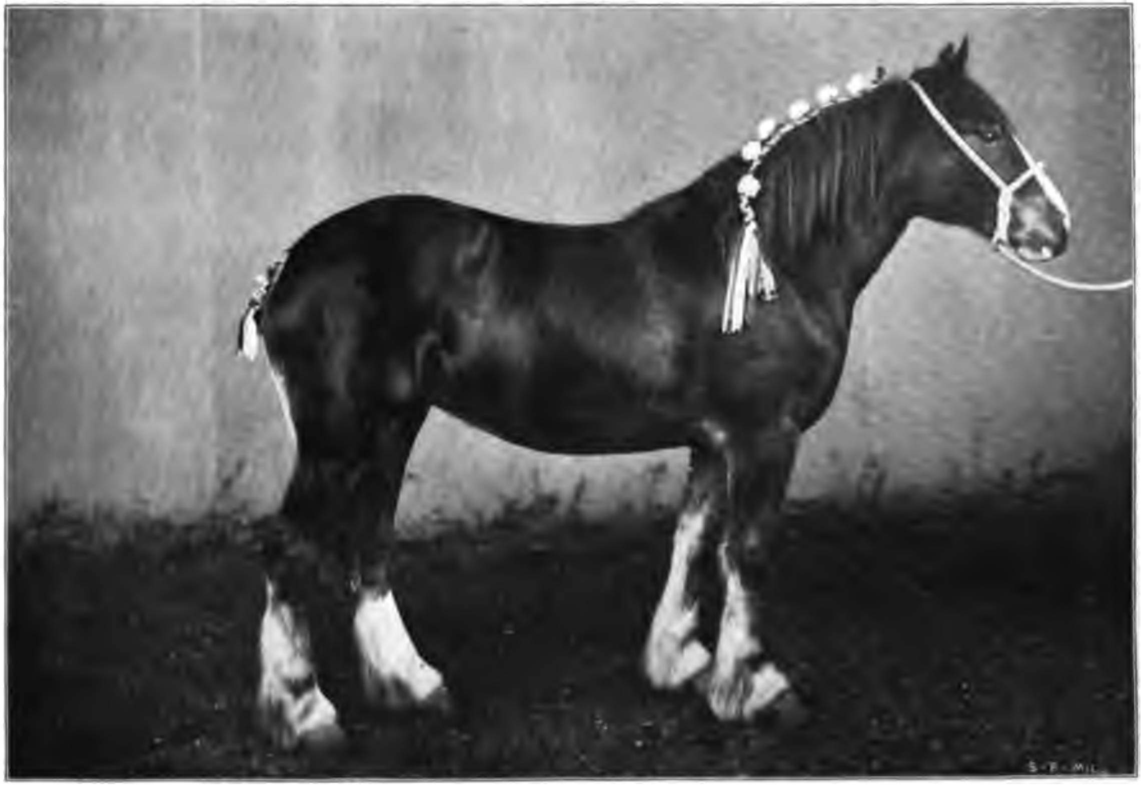
1st Prem.,	McLay Bros	$15 00
2nd Prem.,	Alex Galbraith & Son	10 00

Mare 1 year and under 2.

1st Prem.,	Ethelwold Farms	$15 00
2nd Prem.,	Ethelwold Farms	10 00

Foal under 1 year.

1st Prem.,	McLay Bros	$10 00
2nd Prem.,	McLay Bros	5 00
3rd Prem.,	McLay Bros	3 00



Clydesdale Prize Winner.

UofM

Belgian and Suffolk.

Stallion 3 years old or over.

1st Prem., A. R. Ives	$20 00
2nd Prem., Alex Galbraith & Son	10 00
3rd Prem., Alex Galbraith & Son	5 00

Stallion 2 years and under 3.

1st Prem., Alex Galbraith & Son	$20 00

Coach Breeds and Hackneys.

Stallion 3 years old or over.

1st Prem., Pabst Stock Farm, Oconomowoc, Wis	$25 00
2nd Prem., Alex Galbraith & Son	20 00

Stallion 2 years and under 3.

1st Prem., Pabst Stock Farm	$25 00

Mare 3 years old or over.

1st Prem., Pabst Stock Farm	$20 00
2nd Prem., Pabst Stock Farm	15 00
3rd Prem., A. R. Ives	5 00

Mare 2 years and under 3.

1st Prem., Pabst Stock Farm	$15 00
2nd Prem., Pabst Stock Farm	10 00
3rd Prem., A. R. Ives	5 00

Mare 1 year and under 2.

1st Prem., Pabst Stock Farm	$15 00
2nd Prem., Pabst Stock Farm	10 00
3rd Prem., A. R. Ives	5 00

Foal under 1 year.

1st Prem., Pabst Stock Farm	$10 00
2nd Prem., Pabst Stock Farm	5 00
3rd Prem., A. R. Ives	3 00

Standard Bred and Registered Trotting Horses.

Stallion 3 years old or over.

1st Prem.,	A. E. Rundell	$25 00
2nd Prem.,	Uihlein Bros., Milwaukee, Wis	20 00
3rd Prem.,	Uihlein Bros	10 00

Stallion 2 years and under 3.

1st Prem.,	Uihlein Bros	$25 00
2nd Prem.,	Uihlein Bros	20 00
3rd Prem.,	J. C. Land	10 00

Stallion 1 year and under 2.

1st Prem.,	Uihlein Bros	$15 00
2nd Prem.,	J. C. Land	10 00

Mare 3 years old or over.

1st Prem.,	Uihlein Bros	$20 00
2nd Prem.,	Uihlein Bros	15 00
3rd Prem.,	Uihlein Bros	5 00

Mare 2 years and under 3.

1st Prem.,	Uihlein Bros	$15 00
2nd Prem.,	Ethelwold Farms	10 00

Mare 1 year and under 2.

1st Prem.,	Uihlein Bros	$15 00

Foal under 1 year.

1st Prem.,	Uihlein Bros	$10 00
2nd Prem.,	J. McD. Randles	5 00
3rd Prem.,	Uihlein Bros	3 00

Grade Draft.

Grade mare or gelding 3 years old or over.

1st Prem.,	Sleep Bros	$20 00
2nd Prem.,	Geo. F. Carroll	15 00
3rd Prem.,	Lewis Roberts	10 00

Grade mare or gelding under 3 years.

1st Prem.,	Sleep Bros	$20 00
2nd Prem.,	Sleep Bros	15 00

CATTLE.

Judges.

Dr. M. B. Wood, Mankato, Minn.
Prof. C. F. Curtiss, Ames, Ia.
Thomas Clark, Beecher, Ill.

SHORT HORNS.

Open Class.

Bull 3 years old or over.

1st Prem.,	F. W. Harding, Waukesha, Wis	$20 00
2nd Prem.,	S. M. Quaw, Wausau, Wis	15 00

Bull 2 years and under 3.

1st Prem.,	Herr Bros. & Reynolds, Lodi, Wis	$20 00
2nd Prem.,	Fox & Gallagher, Oregon, Wis	15 00
3rd Prem.,	R. Connor Co., Auburndale, Wis	10 00

Bull senior yearling.

1st Prem.,	Herr Bros. & Reynolds	$20 00
2nd Prem.,	E. D. Jones & Son, Rockland, Wis	15 00
3rd Prem.,	R. Connor Co	10 00

Bull junior yearling.

1st Prem.,	Herr Bros. & Reynolds	$20 00
2nd Prem.,	F. W. Harding	15 00

Bull senior calf.

1st Prem.,	F. W. Harding	$20 00
2nd Prem.,	F. W. Harding	15 00
3rd Prem.,	Herr Bros. & Reynolds	10 00
4th Prem.,	F. W. Harding	6 00
5th Prem.,	S. M. Quaw	5 00

Bull junior calf.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., R. Connor Co.	10 00
4th Prem., E. D. Jones & Son	6 00
5th Prem., S. M. Quaw	5 00

Cow 3 years old or over.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Herr Bros. & Reynolds	10 00
4th Prem., R. Connor Co.	6 00

Heifer 2 years and under 3.

1st Prem., F. W. Harding	$20 00
2nd Prem. Herr Bros. & Reynolds	15 00
3rd Prem., F. W. Harding	10 00
4th Prem., E. D. Jones & Son	6 00

Heifer senior yearling.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., S. M. Quaw	10 00
4th Prem., S. M. Quaw	6 00

Heifer junior yearling.

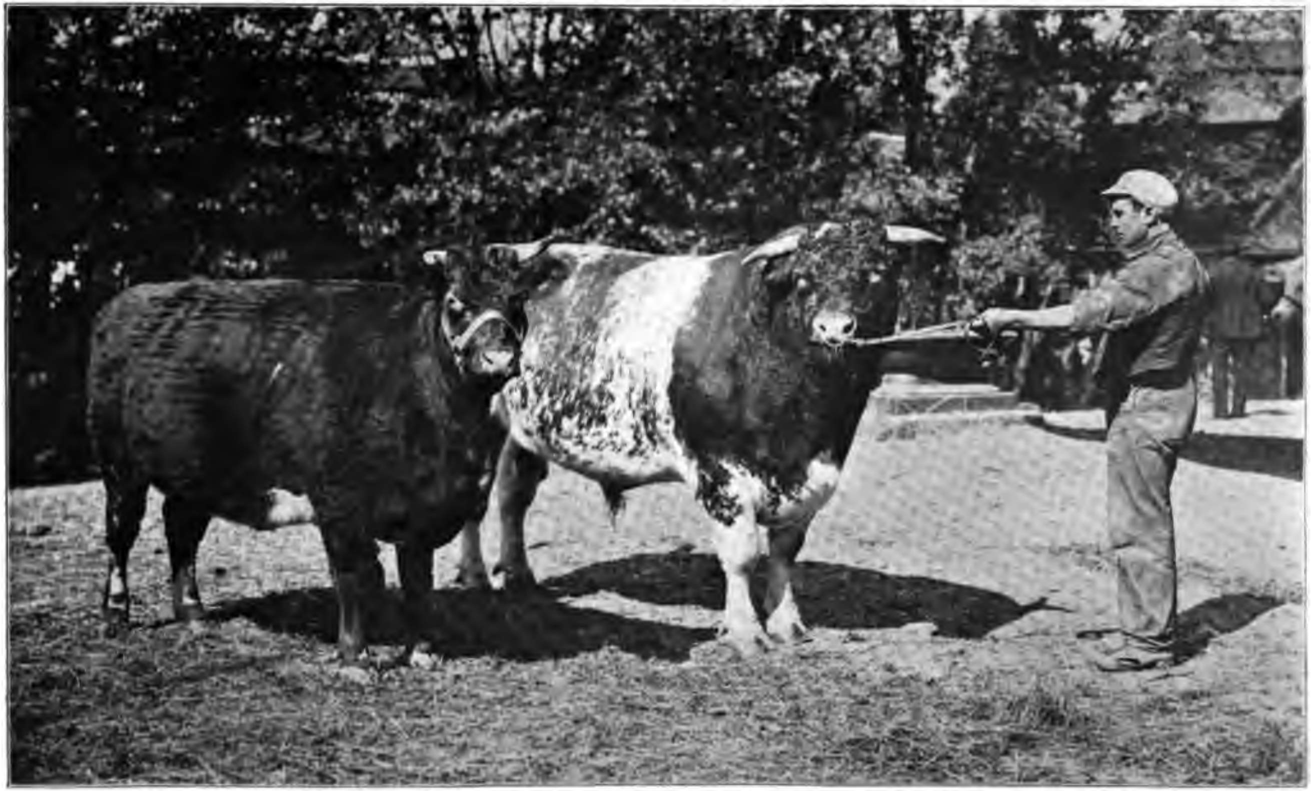
1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Herr Bros. & Reynolds	10 00
4th Prem., E. D. Jones & Son	6 00

Heifer senior calf.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Fox & Gallagher	10 00
4th Prem., Herr Bros. & Reynolds	6 00
5th Prem., Herr Bros. & Reynolds	5 00

Heifer junior calf.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., R. Connor Co.	10 00
4th Prem., Fox & Gallagher	6 00
5th Prem., F. W. Harding	5 00



Shorthorn Champions.

Champions.

Senior bull 2 years old of over, F. W. Harding	$20 00
Junior bull under 2 years, F. W. Harding	20 00
Senior cow over 2 years, F. W. Harding	20 00
Junior heifer under 2 years, F. W. Harding	20 00

Grand Champions.

Grand champion bull any age, F. W. Harding	$20 00
Grand champion cow any age, F. W. Harding	20 00

Aged herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., S. M. Quaw	10 00

Young herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., E. D. Jones & Son	10 00

Calf herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., R. Connor Co	10 00

Get or sire.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., Fox & Gallagher	10 00

Produce of dam.

1st Prem., F. W. Harding	$20 00
2nd Prem., Herr Bros. & Reynolds	18 00
3rd Prem., E. D. Jones & Son	8 00

Wisconsin Class.

Bull 3 years old or over.

1st Prem., F. W. Harding	$20 00
2nd Prem., S. M. Quaw	15 00

Bull 2 years and under 3.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., Fox & Gallagher	15 00
3rd Prem., R. Connor Co	10 00

Bull senior yearling.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., E. D. Jones & Son	15 00
3rd Prem., R. Connor Co	10 00

Bull junior yearling.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00

Bull senior calf.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Herr Bros. & Reynolds	10 00
4th Prem., F. W. Harding	8 00
5th Prem., S. M. Quaw	6 00
6th Prem., Fox & Gallagher	4 00

Bull junior calf.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., R. Connor Co	10 00
4th Prem., S. M. Quaw	5 00

Cow 3 years old or over.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Herr Bros. & Reynolds	10 00
4th Prem., R. Connor Co	8 00
5th Prem., R. Connor Co	6 00
6th Prem., S. M. Quaw	4 00

Heifer 2 years and under 3.

1st Prem., F. W. Harding	$20 00
2nd Prem., Herr Bros. & Reynolds	15 00
3rd Prem., F. W. Harding	10 00
4th Prem., E. D. Jones & Son	8 00
5th Prem., S. M. Quaw	6 00
6th Prem., S. M. Quaw	4 00

Heifer senior yearling.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., S. M. Quaw	10 00
4th Prem., S. M. Quaw	8 00

Heifer junior yearling.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Herr Bros. & Reynolds	10 00
4th Prem., E. D. Jones & Son	8 00
5th Prem., E. D. Jones & Son	6 00
6th Prem., R. Connor Co	4 00

Heifer senior calf.

1st Prem., F. W. Harding	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., Fox & Gallagher	10 00
4th Prem., Herr Bros. & Reynolds	8 00
5th Prem., Herr Bros. & Reynolds	6 00
6th Prem., F. W. Harding	4 00

Heifer junior calf.

1st Prem., Herr Bros. & Reynolds	$20 00
2nd Prem., F. W. Harding	15 00
3rd Prem., R. Connor Co	10 00
4th Prem., Fox & Gallagher	8 00
5th Prem., F. W. Harding	6 00
6th Prem., R. Connor Co	4 00

Champions.

Senior bull 2 years old or over, F. W. Harding	$20 00
Junior bull under 2 years, F. W. Harding	20 00
Senior cow two years old or over, F. W. Harding	20 00
Junior heifer under 2 years, F. W. Harding	20 00

Grand Champions.

Grand champion bull any age, F. W. Harding	$20 00
Grand champion cow any age, F. W. Harding	20 00

Aged herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., S. M. Quaw	10 00
4th Prem., R. Connor Co	10 00

Young herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., E. D. Jones & Son	10 00
4th Prem., R. Connor Co	10 00

Calf herd.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., R. Connor Co	10 00
4th Prem., S. M. Quaw	10 00

Get of sire.

1st Prem., F. W. Harding	$30 00
2nd Prem., Herr Bros. & Reynolds	20 00
3rd Prem., Fox & Gallagher	10 00
4th Prem., E. D. Jones & Son	10 00
5th Prem., S. M. Quaw	10 00

Produce of dam.

1st Prem., F. W. Harding	$20 00
2nd Prem., Herr Bros. & Reynolds	18 00
3rd Prem., E. D. Jones & Son	10 00
4th Prem., S. M. Quaw	10 00
5th Prem., R. Connor Co	10 00

HEREFORD.

Bull 3 years old or over.

1st Prem., Cargill & McMillan, La Crosse, Wis	$25 00

Bull 2 years and under 3.

1st Prem., J. C. Robinson, Evansville, Wis	$25 00

Bull senior yearling.

1st Prem., Heath Stock Farm, Smithboro, Ill	$25 00

Bull junior yearling.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., Heath Stock Farm	15 00

Bull senior calf.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Heath Stock Farm	20 00
3rd Prem., Heath Stock Farm	15 00

Bull junior calf.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., J. C. Robinson	20 00

Cow 3 years old or over.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., J. C. Robinson	20 00
3rd Prem., J. C Robinson	15 00

Cow 2 years and under 3.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., J. C. Robinson	15 00

Heifer senior yearling.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., Heath Stock Farm	15 00

Heifer junior yearling.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., Heath Stock Farm	15 00

Heifer senior calf.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., Cargill & McMillan	15 00

Heifer junior calf.

1st Prem., Heath Stock Farm	$25 00
2nd Prem., Cargill & McMillan	20 00
3rd Prem., Heath Stock Farm	15 00

Champions.

Senior bull over 2 years, Cargill & McMillan	$25 00
Junior bull under 2 years, Cargill & McMillan	25 00
Senior cow over 2 years, Cargill & McMillan	25 00
Junior heifer under 2 years, Cargill & McMillan	25 00

Grand Champions.

Grand champion bull any age, Cargill & McMillan	$25 00
Grand champion cow any age, Cargill & McMillan	25 00

Aged herd.

1st Prem., Cargill & McMillan	$30 00
2nd Prem., J. C. Robinson	20 00

Young herd.

1st Prem., Cargill & McMillan	$30 00
2nd Prem., J. C. Robinson	20 00

Calf herd.

1st Prem., Cargill & McMillan	$30 00

Get of sire.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., J. C. Robinson	20 00

Produce of dam.

1st Prem., Cargill & McMillan	$25 00
2nd Prem., J. C. Robinson	20 00

ABERDEEN-ANGUS.

Bull 3 years old or over.

1st Prem., O. V. Battles, Maquoketa, Ia	$20 00
2nd Prem., Alexander Stewart Lumber Co., Wausau, Wis	15 00

Bull 2 years old or over.

1st Prem., W. A. McHenry, Denison, Ia	$20 00
2nd Prem., O. V. Battles	15 00

Bull 1 year and under 2.

1st Prem., O. V. Battles	$15 00
2nd Prem., W. A. McHenry	10 00
3rd Prem., Alexander Stewart Lumber Co	5 00

Bull under 1 year.

1st Prem., O. V. Battles	$15 00
2nd Prem., W. A. McHenry	10 00
3rd Prem., Alexander Stewart Lumber Co	5 00

Cow 3 years old or over.

1st Prem., O. V. Battles	$20 00
2nd Prem., W. A. McHenry	15 00
3rd Prem., Alexander Stewart Lumber Co	5 00

Heifer 2 years and under 3.

1st Prem., W. A. McHenry	$20 00
2nd Prem., O. V. Battles	15 00
3rd Prem., Alexander Stewart Lumber Co	5 00

Heifer 1 year and under 2.

1st Prem., O. V. Battles	$15 00
2nd Prem., W. A. McHenry	10 00
3rd Prem., W. A. McHenry	5 00

Heifer under 1 year.

1st Prem., W. A. McHenry	$15 00
2nd Prem., O. V. Battles	10 00
3rd Prem., O. V. Battles	5 00

Get of sire.

1st Prem., W. A. McHenry	$25 00
2nd Prem., O. V. Battles	15 00
3rd Prem., Alexander Stewart Lumber Co	5 06

Produce of dam.

1st Prem., W. A. McHenry	$20 00
2nd Prem., O. V. Battles	15 00
3rd Prem., Alexander Stewart Lumber Co	5 00

Aged herd.

1st Prem., O. V. Battles	$25 00
2nd Prem., W. A. McHenry	15 00

Young herd.

1st Prem., W. A. McHenry	$25 00

Champions.

Bull over 2 years, O. V. Battles	$15 00
Cow over 2 years, O. V. Battles	15 00
Bull under 2 years, O. V. Battles	15 00
Heifer under 2 years, W. A. McHenry	15 00

Special Premiums.

Bull 3 years old or over.

1st Prem.,	O. V. Battles	$18 00
2nd Prem.,	Alexander Stewart Lumber Co	12 00

Bull 2 years and under 3.

1st Prem.,	W. A. McHenry	$18 00
2nd Prem.,	O. V. Battles	12 00

Bull 1 year and under 2.

1st Prem.,	O. V. Battles	$18 00
2nd Prem.,	W. A. McHenry	12 00
3rd Prem.,	Alexander Stewart Lumber Co	8 00

Bull under 1 year.

1st Prem.,	O. V. Battles	$18 00
2nd Prem.,	W. A. McHenry	12 00
3rd Prem.,	Alexander Stewart Lumber Co	8 00
4th Prem.,	Alexander Stewart Lumber Co	6 00

Cow 3 years old or over.

1st Prem.,	O. V. Battles	$18 00
2nd Prem.,	W. A. McHenry	12 00
3rd Prem.,	Alexander Stewart Lumber Co	8 00
4th Prem.,	Alexander Stewart Lumber Co	6 00

Heifer 1 year and under 2.

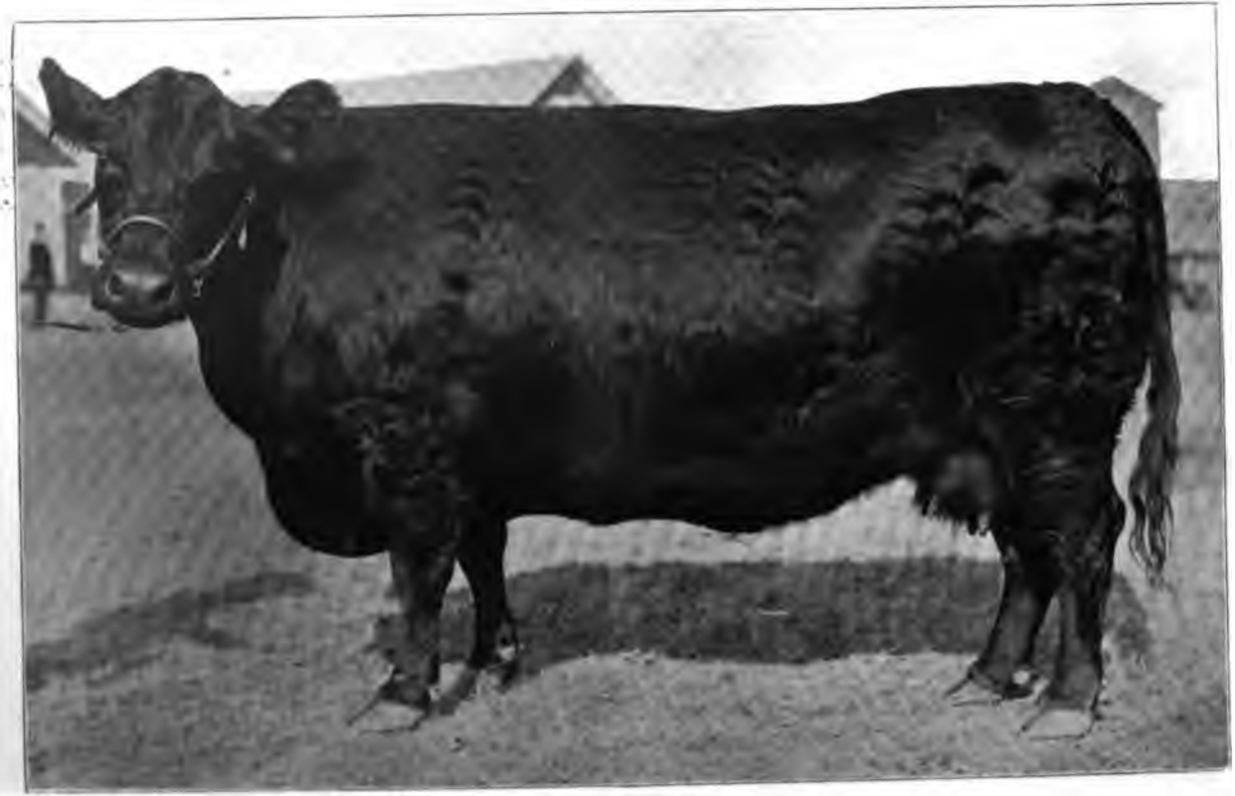
1st Prem.,	W. A. McHenry	$18 00
2nd Prem.,	O. V. Battles	12 00
3rd Prem.,	Alexander Stewart Lumber Co	8 00

Heifer 2 years and under 3.

1st Prem.,	O. V. Battles	$18 00
2nd Prem.,	W. A. McHenry	12 00
3rd Prem.,	W. A. McHenry	8 00
4th Prem.,	Alexander Stewart Lumber Co	6 00
5th Prem.,	Alexander Stewart Lumber Co	4 00
6th Prem.,	O. V. Battles	2 00

Heifer under 1 year.

1st Prem.,	W. A. McHenry	$18 00
2nd Prem.,	O. V. Battles	12 00
3rd Prem.,	O. V. Battles	8 00
4th Prem.,	W. A. McHenry	6 00
5th Prem.,	W. A. McHenry	4 00
6th Prem.,	O. V. Battles	2 00



Typical Galloway.

GALLOWAY.

Bull 3 years old or over.

1st Prem., C. S. Hechtner, Princeton, Ill.	$20 00

Bull under 1 year.

1st Prem., C. S. Hechtner	$15 00
2nd Prem., C. S. Hechtner	10 00

Cow 3 years old or over.

1st Prem., C. S. Hechtner	$20 00

Heifer 2 years and under 3.

1st Prem., C. S. Hechtner	$20 00

Heifer 1 year and under 2.

1st Prem., C. S. Hechtner	$15 00
2nd Prem., C. S. Hechtner	10 00

Heifer under 1 year.

1st Prem., C. S. Hechtner	$15 00
2nd Prem., C. S. Hechtner	10 00

Get of sire.

1st Prem., C. S. Hechtner	$25 00

Produce of dam.

1st Prem., C. S. Hechtner	$20 00

Aged herd.

1st Prem., C. S. Hechtner	$25 00

Young herd.

1st Prem., C. S. Hechtner	$25 00

Champions.

Bull over 2 years, C. S. Hechtner	$15 00
Cow over 2 years, C. S. Hechtner	15 00
Bull under 2 years, C. S. Hechtner	15 00
Heifer under 1 year, C. S. Hechtner	15 00

POLLED DURHAM.

Bull 3 years old or over.

1st Prem., F. S. Bunker, Delton, Wis	$25 00
2nd Prem., William Smiley, Albany, Wis	20 00

Bull 2 years and under 3.

1st Prem., William Smiley	$25 00

Bull 1 year and under 2.

1st Prem., William Smiley	$25 00

Bull under 1 year.

1st Prem., F. S. Bunker	$25 00
2nd Prem., William Smiley	20 00

Cow 3 years old or over.

1st Prem., William Smiley	$25 00

Heifer 2 years and under 3.

1st Prem., William Smiley	$25 00

Heifer 1 year and under 2.

1st Prem., F. S. Bunker	$25 00
2nd Prem., William Smiley	20 00

Heifer under 1 year.

1st Prem., F. S. Bunker	$25 00
2nd Prem., William Smiley	20 00

Produce of dam.

1st Prem., William Smiley	$25 00

Aged herd.

1st Prem., William Smiley	$25 00

Champions.

Bull over 2 years, F. S. Bunker	$15 00
Cow over 2 years, William Smiley	15 00
Bull under 2 years, F. S. Bunker	15 00
Heifer under 2 years, F. S. Bunker	15 00

RED POLLED.

Bull 3 years old or over.

1st Prem., Frank J. Clouss, Claire, Ia	$20 00
2nd Prem., Geo. Ineichen & Son, Geneva, Ind	15 00
3rd Prem., Adolph P. Arp., Eldridge, Ia	8 00

Bull 2 years and under 3.

1st Prem., Adolph P. Arp	$20 00
2nd Prem., Geo. Ineichen & Son	15 00

Bull 1 year and under 2.

1st Prem., Adolph P. Arp	$15 00
2nd Prem., Adolph P. Arp	10 00
3rd Prem., A. W. Dopke, North Milwaukee, Wis	5 00

Bull under 1 year.

1st Prem., Frank J. Clouss	$15 00
2nd Prem., Frank J. Clouss	10 00
3rd Prem., Adolph P. Arp	5 00

Cow 3 years old or over.

1st Prem., Geo. Ineichen & Son	$20 00
2nd Prem., Adolph P. Arp	15 00
3rd Prem., A. W. Dopke	8 00

Heifer 2 years and under 3.

1st Prem., Geo. Ineichen & Son	$20 00
2nd Prem., Adolph P. Arp	15 00
3rd Prem., Frank J. Clouss	8 00

Heifer 1 year and under 2.

1st Prem., Frank J. Clouss	$15 00
2nd Prem., Frank J. Clouss	10 00
3rd Prem., Jacob Slimmer, Wausau, Wis	50 00

Heifer under 1 year.

1st Prem., Frank J. Clouss	$15 00
2nd Prem., Frank J. Clouss	10 00
3rd Prem., Geo. Ineichen & Son	5 00

Get of sire.

1st Prem., Adolph P. Arp	$20 00
2nd Prem., Frank J. Clouss	15 00
3rd Prem., Geo. Ineichen & Son	5 00

Produce of dam.

1st Prem., Adolph P. Arp	$20 00
2nd Prem., Frank J. Clouss	15 00
3rd Prem., Geo. Ineichen & Son	5 00

Aged herd.

1st Prem., Frank J. Clouss	$25 00
2nd Prem., Geo. Ineichen & Son	15 00

Young herd.

1st Prem., Adolph P. Arp	$25 00
2nd Prem., Jacob Slimmer	15 00

Champions.

Bull over 2 years, Frank J. Clouss	$15 00
Cow over 2 years, Geo. Ineichen & Son	15 00
Bull under 2 years, Frank J. Clouss	15 00
Heifer under 2 years, Frank J. Clouss	15 00

Cow 3 years old or over giving highest per cent of total butter fat.

1st Prem., Geo. Ineichen & Son	$100 00
2nd Prem., Jacob Slimmer	60 00

SPECIAL PREMIUMS.

Fat Steers.

Red Polled fat steer over 1 year.

1st Prem., Adolph P. Arp	$24 00
2nd Prem., Adolph P. Arp	16 00

Red Polled fat steer over 1 year and under 2.

1st Prem., Adolph P. Arp	$24 00
2nd Prem., Adolph P. Arp	16 00

Fat Cattle.

Steer or spayed heifer 2 years old or over.

1st Prem., C. S. Hechtner	$12 00

HOLSTEIN-FREISIAN.

Bull 3 years old or over.

1st Prem.,	John B. Irwin, Minneapolis, Minn	$25 00
2nd Prem.,	Nim Johnson & Sons, Elkhorn, Wis	18 00

Bull 2 years and under 3.

1st Prem.,	Rust Bros., West Allis, Wis	$25 00
2nd Prem.,	John B. Irwin	18 00
3rd Prem.,	Geo. J. Schuster, Mukwonago, Wis	10 00

Bull 1 year and under 2.

1st Prem.,	John B. Irwin	$25 00
2nd Prem.,	Rust Bros	18 00
3rd Prem.,	Geo. J. Schuster	10 00

Bull under 1 year.

1st Prem.,	Rust Bros	$25 00
2nd Prem.,	Neal Houslet, Packwaukee, Wis	18 00
3rd Prem.,	John B. Irwin	10 00

Cow 3 years old or over.

1st Prem.,	John B. Irwin	$25 00
2nd Prem.,	Rust Bros	18 00
3rd Prem.,	Rust Bros	10 00

Heifer 2 years and under 3.

1st Prem.,	Geo. J. Schuster	$25 00
2nd Prem.,	Geo. J. Schuster	18 00
3rd Prem.,	Rust Bros	10 00

Heifer year and under 2.

1st Prem.,	Rust Bros	$25 00
2nd Prem.,	Rust Bros	18 00
3rd Prem.,	Rust Bros	10 00

Heifer under 1 year.

1st Prem.,	John B. Irwin	$25 00
2nd Prem.,	John B. Irwin	18 00
3rd Prem.,	Rust Bros	10 00

Get of sire.

1st Prem.,	Geo. J. Schuster	$30 00
2nd Prem.,	Rust Bros	20 00
3rd Prem.,	John B. Irwin	10 00

Produce of cow.

1st Prem., Rust Bros	$30 00
2nd Prem., John B. Irwin	20 00
3rd Prem., Geo. J. Schuster	10 00

Aged herd.

1st Prem., John B. Irwin	$30 00
2nd Prem., Rust Bros	20 00

Young herd.

1st Prem., Rust Bros	$30 00
2nd Prem., Geo. J. Schuster	20 00

Champions.

Bull over 2 years, John B. Irwin	$20 00
Cow over 2 years, John B. Irwin	20 00
Bull under 2 years, John B. Irwin	20 00
Heifer under 2 years, Rust Bros	20 00

GUERNSEY.

Bull 3 years old or over.

1st Prem., Fox Bros., Waukesha, Wis	$20 00
2nd Prem., W. M. Jones, Waukesha, Wis	15 00
3rd Prem., Fred Vogel, Jr., Milwaukee, Wis	10 00

Bull 2 years and under 3.

1st Prem., Fox Bros	$20 00

Bull 1 year and under 2.

1st Prem., W. M. Jones	$15 00
2nd Prem, Fred Vogel, Jr	10 00
3rd Prem., Howard Greene, Genesee Depot, Wis	6 00

Bull under 1 year.

1st Prem., Howard Greene	$15 00
2nd Prem., W. M. Jones	10 00
3rd Prem., Howard Greene	6 00

Cow 3 years old or over.

1st Prem., Fred Vogel, Jr	$20 00
2nd Prem., Fred Vogel, Jr	15 00
3rd Prem., W. M. Jones	10 00
4th Prem., Fox Bros	8 00
5th Prem., J. G. Hickcox, Whitefish Bay, Wis	5 00

Cow 2 years and under 3.

1st Prem., Fred Vogel, Jr	$20 00
2nd Prem., W. M. Jones	15 00
3rd Prem., W. M. Jones	10 00
4th Prem., J. G. Hickcox	8 00
5th Prem., W. M. Jones	5 00

Heifer 1 year and under 2

1st Prem., W. M. Jones	$20 00
2nd Prem., Howard Greene	15 00
3rd Prem., W. M. Jones	10 00
4th Prem., J. G. Hickcox	8 00
5th Prem., Fox Bros	5 00

Heifer under 1 year.

1st Prem., W. M. Jones	$15 00
2nd Prem., J. G. Hickcox	10 00
3rd Prem., J. G. Hickcox	8 00
4th Prem., W. M. Jones	5 00

Get of sire.

1st Prem., W. M. Jones	$25 00
2nd Prem., Fox Bros	15 00
3rd Prem., J. G. Hickcox	10 00

Produce of cow.

1st Prem., W. M. Jones	$20 00
2nd Prem., J. G. Hickcox	15 00

Aged herd.

1st Prem., W. M. Jones	$25 00
2nd Prem., Fox Bros	15 00
3rd Prem., J. G. Hickcox	10 00

Young herd.

1st Prem., W. M. Jones	$25 00
2nd Prem., J. G. Hickcox	15 00

Champions.

Bull over 2 years, Fox Bros........................
Cow over 2 years, Fred Vogel, Jr..................
Bull under 2 years, W. M. Jones...................
Heifer under 2 years, W. M. Jones................

Special Premiums.

The Silver Cup offered by Mr. J. G. Hickcox,
Whitefish Bay, Wis., for "best four animals, ge
awarded to W. M. Jones, Waukesha, Wis.

JERSEY.

Bull 3 years old or over.

1st Prem., E. R. Thomas, Nashotah, Wis.......
2nd Prem., Mrs. Adda F. Howie, Elm Grove, Wis
3rd Prem., Geo. Martin, Darlington, Wis.........

Bull 2 years and under 3.

1st Prem., Scott Deaner, Freeport, Ill............
2nd Prem., Geo. Martin.........................

Bull 1 year and under 2.

1st Prem., Scott Deaner..........................
2nd Prem., Geo. Martin..........................
3rd Prem., Muskego Lakes Jersey Herd, Muskego

Bull under 1 year.

1st Prem., Scott Deaner..........................
2nd Prem., Scott Deaner..........................
3rd Prem., Mrs. Adda F. Howie.................

Cow 3 years old or over.

1st Prem., Scott Deaner..........................
2nd Prem., Mrs. Adda F. Howie.................
3rd Prem., Scott Deaner.........................

Heifer 2 years and under 3.

1st Prem., Scott Deaner..........................
2nd Prem., Muskego Lakes Jersey Herd..........
3rd Prem., Scott Deaner.........................

Heifer 1 year and under 2.

1st Prem., Scott Deaner	$15 00
2nd Prem., Scott Deaner	10 00
3rd Prem., Mrs. Adda F. Howie	5 00

Heifer under 1 year.

1st Prem., Scott Deaner	$15 00
2nd Prem., E. R. Thomas & Son	10 00
3rd Prem., Scott Deaner	5 00

Get of sire.

1st Prem., Scott Deaner	$25 00
2nd Prem., Mrs. Adda F. Howie	15 00
3rd Prem., E. R. Thomas	5 00

Produce of dam.

1st Prem., Scott Deaner	$25 00
2nd Prem., Mrs. Adda F. Howie	15 00
3rd Prem., Muskego Lakes Jersey herd	5 00

Aged herd.

1st Prem., Scott Deaner	$25 00
2nd Prem., Geo. Martin	15 00

Young herd.

1st Prem., Scott Deaner	$25 00
2nd Prem., Mrs. Adda F. Howie	15 00

Champions.

Bull over 2 years, Scott Deaner	$15 00
Cow over 2 years, Scott Deaner	15 00
Bull under 2 years, Scott Deaner	15 00
Heifer under 2 years, Scott Deaner	15 00

AYRSHIRE.

Bull 3 years old or over.

1st Prem., Sam Jones & Son, Juneau, Wis	$20 00
2nd Prem., Adam Seitz, Waukesha, Wis	15 00

Bull 2 years and under 3.

1st Prem., Sam Jones & Son	$20 00
2nd Prem., Adam Seitz	15 00

Bull 1 year and under 2.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....
3rd Prem., Sam Jones & Son ....

Bull under 1 year.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....
3rd Prem., Sam Jones & Son ....

Cow 3 years old or over.

1st Prem., Adam Seitz ....
2nd Prem., Adam Seitz ....
3rd Prem., Adam Seitz ....

Heifer 2 years and under 3.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....
3rd Prem., Sam Jones & Son ....

Heifer 1 year and under 2.

1st Prem., Sam Jones & Son ....
2nd Prem., Adam Seitz ....
3rd Prem., Adam Seitz ....

Heifer under 1 year.

1st Prem., Adam Seitz ....
2nd Prem., Adam Seitz ....
3rd Prem., Sam Jones & Son ....

Get of sire.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....

Produce of dam.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....

Aged herd.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....

Young herd.

1st Prem., Adam Seitz ....
2nd Prem., Sam Jones & Son ....

Champions.

Bull over 2 years, Sam Jones & Son	$15 00
Cow over 2 years, Adam Seitz	15 00
Bull under 2 years, Adam Seitz	15 00
Heifer under 2 years, Sam Jones & Son	15 00

BROWN SWISS.

Bull 3 years old or over.

1st Prem., Joseph Allyn, Delavan, Wis	$20 00
2nd Prem., H. W. Ayers, Honey Creek, Wis	15 00

Bull 1 year and under 2.

1st Prem., Joseph Allyn	$15 00
2nd Prem., H. W. Ayers	10 00
3rd Prem., Joseph Allyn	5 00

Bull under 1 year.

1st Prem., H. W. Ayers	$15 00
2nd Prem., Joseph Allyn	10 00
3rd Prem., H. W. Ayers	5 00

Cow 3 years old or over.

1st Prem., H. W. Ayers	$20 00
2nd Prem., Joseph Allyn	15 00
3rd Prem., Joseph Allyn	8 00

Heifer 2 years and under 3.

1st Prem., H. W. Ayers	$20 00
2nd Prem., Joseph Allyn	15 00
3rd Prem., Joseph Allyn	8 00

Heifer 1 year and under 2.

1st Prem., H. W. Ayers	$15 00
2nd Prem., Joseph Allyn	10 00
3rd Prem., H. W. Ayers	5 00

Heifer under 1 year.

1st Prem., Joseph Allyn	$15 00
2nd Prem., H. W. Ayers	10 00
3rd Prem., H. W. Ayers	5 00

Get of sire.

1st Prem., Joseph Allyn ....
2nd Prem., H. W. Ayers ....

Produce of dam.

1st Prem., Joseph Allyn ....
2nd Prem., H. W. Ayers ....

Aged herd.

1st Prem., Joseph Allyn ....
2nd Prem., H. W. Ayers ....

Young herd.

1st Prem., Joseph Allyn ....
2nd Prem., H. W. Ayers ....

Champions.

Bull over 2 years, Joseph Allyn ....
Cow over 2 years, H. W. Ayers ....
Bull under 2 years, H. W. Ayers ....
Heifer under 2 years, H. W. Ayers..................

SHEEP.

Judges.

H. L. Compton, Kyle, Ohio.
Charles Kerr, St. Paul, Minn.

SHROPSHIRE.

Open Class.

Ram 2 years old or over.

1st Prem., Geo. McKerrow & Sons, Pewaukee, Wis	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ram 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ram under 1 year.

1st Prem., Chandler Bros., Chariton, Ia	$15 00
2nd Prem., Renk Bros., Sun Prairie, Wis	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ewe 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Renk Bros	10 00
3rd Prem., Chandler Bros	5 00

Ewe 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Chandler Bros	10 00
3rd Prem., Chandler Bros	5 00

Ewe under 1 year.

1st Prem., Chandler Bros	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem.. Geo. McKerrow & Sons	5 00

Flock.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Chandler Bros........................
3rd Prem., Renk Bros...........................

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Renk Bros...........................
3rd Prem., W. Woodard, Bloomer, Wis.........

Champion ram any age, Geo. McKerrow & Sons .
Champion ewe any age, Geo. McKerrow & Sons

Best pair of lambs.

1st Prem., Geo. McKerrow & Sons ....

American Breed.

Ram 2 years old or over.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Renk Bros...........................
3rd Prem., John C. Robinson, Evansville, Wis..

Ram 1 year and under 2.

1st Prem., C. J. Poulter, Cumberland, Wis.....
2nd Prem., W. Woodard ....
3rd Prem., Renk Bros...........................

Ram lamb.

1st Prem., Renk Bros...........................
2nd Prem., Geo. McKerrow & Sons ....
3rd Prem., C. J. Poulter ....

Ewe 2 years old or over.

1st Prem., W. Woodard ....
2nd Prem., J. C. Robinson & Son ....
3rd Prem., Renk Bros...........................

Ewe 1 year and under 2.

1st Prem., Renk Bros...........................
2nd Prem., C. J. Poulter ....
3rd Prem., C. J. Poulter ....

Ewe lamb.

1st Prem., Geo. McKerrow & Sons	$12 00
2nd Prem., C. J. Poulter	8 00
3rd Prem., W. Woodard	4 00

Champion ram any age, Geo. McKerrow & Sons	$8 00
Champion ewe any age, Renk Bros	8 00

Get of sire.

1st Prem., Geo. McKerrow & Sons	$12 00
2nd Prem., Renk Bros	4 00

Flock.

1st Prem., C. J. Poulter	$12 00
2nd Prem., W. Woodard	8 00
3rd Prem., Renk Bros	4 00

Wisconsin Bred.

Ram 2 years old or over.

1st Prem., Renk Bros	$15 00
2nd Prem., J. C. Robinson	10 00
3rd Prem., Renk Bros	5 00
4th Prem., J. C. Robinson	3 00
5th Prem., Chas. T. Hill, Brookfield, Wis	2 00

Ram 1 year and under 2.

1st Prem., C. J. Poulter	$15 00
2nd Prem., W. Woodward	10 00
3rd Prem., Renk Bros	5 00
4th Prem., Renk Bros	3 00
5th Prem., Renk Bros	2 00

Ram under 1 year.

1st Prem., Renk Bros	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., W. Woodard	5 00
4th Prem., C. J. Poulter	3 00
5th Prem., Geo. McKerrow & Sons	2 00

Ewe 2 years old or over.

1st Prem., W. Woodard ....
2nd Prem., J. C. Robinson ....
3rd Prem., Renk Bros...........................
4th Prem., W. Woodard ....
5th Prem., J. C. Robinson ....

Ewe 1 year and under 2.

1st Prem., Renk Bros...........................
2nd Prem., C. J. Poulter ....
3rd Prem., C. J. Poulter ....
4th Prem., W. Woodard ....
5th Prem., J. C. Robinson ....

Ewe 2 years old or over.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., C. J. Poulter ....
3rd Prem., W. Woodard ....
4th Prem., Renk Bros...........................
5th Prem., Geo. McKerrow & Sons ....

Flock.

1st Prem., W. Woodard ....
2nd Prem., Renk Bros...........................
3rd Prem., J. C. Robinson ....

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Renk Bros...........................
3rd Prem., C. J. Poulter ....

Champion ram any age, C. J. Poulter ....
Champion ewe any age, Renk Bros................

Best pair of lambs.

Prem., Geo. McKerrow & Sons ....

OXFORD.

Open Class.

Ram 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., A. J. Mohr, Bloomer, Wis	10 00

Ram 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ram under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ewe 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., A. J. Mohr	5 00

Ewe 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Ewe under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00
3rd Prem., Geo. McKerrow & Sons	5 00

Flock.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., William Smiley, Albany, Wis	10 00

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., William Smiley	10 00

Champion ram any age, Geo. McKerrow & Sons	$15 00
Champion ewe any age, Geo. McKerrow & Sons	10 00

Best pair of lambs.

Prem., Geo. McKerrow & Sons	$10 00

Wisconsin Bred.

Yearling ram.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., William Smiley ....

Yearling ewe.

1st Prem., A. J. Mohr ....
2nd Prem., Geo. McKerrow & Sons ....

Ram lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Specials.

Ram 1 year old.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., William Smiley ....

Ram lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Ewe 1 year old.

1st Prem., A. J. Mohr ....
2nd Prem., Geo. McKerrow & Sons ....

Ewe lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Geo. McKerrow & Sons ....

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

SOUTHDOWN.

Ram 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ram 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00

Ram under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00

Ewe 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ewe 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ewe under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Flock.

1st Prem., Geo. McKerrow & Sons	$15 00

Champion ram any age, Geo. McKerrow & Sons	$15 00
Champion ewe any age, Geo. McKerrow & Sons	15 00

Best pair of lambs.

Prem., Geo. McKerrow & Sons	$10 00

HAMPSHIRE.

Ram 2 years old or over.

1st Prem., F. W. Harding, Waukesha, Wis	$15 00
2nd Prem., F. W. Harding	10 00
3rd Prem., Alex W. Arnold, Galesville, Wis	5 00

Wisconsin Bred.

Yearling ram.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., William Smiley ....

Yearling ewe.

1st Prem., A. J. Mohr ....
2nd Prem., Geo. McKerrow & Sons ....

Ram lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Specials.

Ram 1 year old.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., William Smiley ....

Ram lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

Ewe 1 year old.

1st Prem., A. J. Mohr ....
2nd Prem., Geo. McKerrow & Sons ....

Ewe lamb.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., Geo. McKerrow & Sons ....

Pen of four lambs.

1st Prem., Geo. McKerrow & Sons ....
2nd Prem., A. J. Mohr ....

SOUTHDOWN.

Ram 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ram 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00

Ram under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00

Ewe 2 years old or over.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ewe 1 year and under 2.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Ewe under 1 year.

1st Prem., Geo. McKerrow & Sons	$15 00
2nd Prem., Geo. McKerrow & Sons	10 00

Flock.

1st Prem., Geo. McKerrow & Sons	$15 00

Champion ram any age, Geo. McKerrow & Sons	$15 00
Champion ewe any age, Geo. McKerrow & Sons	15 00

Best pair of lambs.

Prem., Geo. McKerrow & Sons	$10 00

HAMPSHIRE.

Ram 2 years old or over.

1st Prem., F. W. Harding, Waukesha, Wis.	$15 00
2nd Prem., F. W. Harding	10 00
3rd Prem., Alex W. Arnold, Galesville, Wis.	5 00

Ram 1 year and under 2.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. H. Patton, Lyons, Wis..........

Ram under 1 year.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Ewe 2 years old or over.

1st Prem., F. W. Harding ....
2nd Prem., Renk Bros.............................
3rd Prem., F. W. Harding ....

Ewe 1 year old or over.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Ewe under 1 year.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Flock.

1st Prem., F. W. Harding ....
2nd Prem., Renk Bros.............................
3rd Prem., Alex W. Arnold ....

Pen of four lambs.

1st Prem., Renk Bros.............................
2nd Prem., Alex W. Arnold ....
3rd Prem., F. H. Patton ....

Champion ram any age, F. W. Harding ....
Champion ewe any age, F. W. Harding ....

Best pair of lambs.

Prem., Renk Bros.................................

Specials.

Four lambs.

1st Prem., Renk Bros	$24 00
2nd Prem., Alex W. Arnold	16 00
3rd Prem., F. H. Patton	10 00

Wisconsin Bred.

Yearling ram.

1st Prem., F. H. Patton	$10 00

Ram lamb.

1st Prem., Renk Bros	$10 00
2nd Prem., Renk Bros	6 00

Yearling ewe.

1st Prem., Renk Bros	$10 00
2nd Prem., W. G. Bartholf, Burlington, Wis	6 00

Ewe lamb.

1st Prem., Renk Bros	$10 00
2nd Prem., F. H. Patton	6 00

Pair of lambs.

1st Prem., Renk Bros	$10 00
2nd Prem., W. G. Bartholf	6 00

COTSWOLD.

Ram 2 years old or over.

1st Prem., F. W. Harding	$25 00
2nd Prem., Lewis Bros., Camp Point, Ill	15 00
3rd Prem., Lewis Bros	10 00

Ram 1 year and under 2.

1st Prem., Lewis Bros	$25 00
2nd Prem., F. W. Harding	15 00
3rd Prem., F. W. Harding	10 00

Ram 1 year and under 2.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. H. Patton, Lyons, Wis.........

Ram under 1 year.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Ewe 2 years old or over.

1st Prem., F. W. Harding ....
2nd Prem., Renk Bros...........................
3rd Prem., F. W. Harding ....

Ewe 1 year old or over.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Ewe under 1 year.

1st Prem., F. W. Harding ....
2nd Prem., F. W. Harding ....
3rd Prem., F. W. Harding ....

Flock.

1st Prem., F. W. Harding ....
2nd Prem., Renk Bros...........................
3rd Prem., Alex W. Arnold ....

Pen of four lambs.

1st Prem., Renk Bros...........................
2nd Prem., Alex W. Arnold ....
3rd Prem., F. H. Patton ....

Champion ram any age, F. W. Harding ....
Champion ewe any age, F. W. Harding ....

Best pair of lambs.

Prem., Renk Bros...............................

Specials.

Four lambs.

1st Prem.,	Renk Bros	$24 00
2nd Prem.,	Alex W. Arnold	16 00
3rd Prem.,	F. H. Patton	10 00

Wisconsin Bred.

Yearling ram.

1st Prem.,	F. H. Patton	$10 00

Ram lamb.

1st Prem.,	Renk Bros	$10 00
2nd Prem.,	Renk Bros	6 00

Yearling ewe.

1st Prem.,	Renk Bros	$10 00
2nd Prem.,	W. G. Bartholf, Burlington, Wis	6 00

Ewe lamb.

1st Prem.,	Renk Bros	$10 00
2nd Prem.,	F. H. Patton	6 00

Pair of lambs.

1st Prem.,	Renk Bros	$10 00
2nd Prem.,	W. G. Bartholf	6 00

COTSWOLD.

Ram 2 years old or over.

1st Prem.,	F. W. Harding	$25 00
2nd Prem.,	Lewis Bros., Camp Point, Ill	15 00
3rd Prem.,	Lewis Bros	10 00

Ram 1 year and under 2.

1st Prem.,	Lewis Bros	$25 00
2nd Prem.,	F. W. Harding	15 00
3rd Prem.,	F. W. Harding	10 00

Ram under 1 year.

1st Prem., F. W. Harding	$25 00
2nd Prem., Lewis Bros	15 00
3rd Prem., F. W. Harding	10 00

Ewe 2 years old or over.

1st Prem., Lewis Bros	$25 00
2nd Prem., F. W. Harding	15 00
3rd Prem., F. W. Harding	10 00

Ewe 1 year and under 2.

1st Prem., F. W. Harding	$25 00
2nd Prem., Lewis Bros	15 00
3rd Prem., F. W. Harding	10 00

Ewe under 1 year.

1st Prem., F. W. Harding	$25 00
2nd Prem., Lewis Bros	15 00
3rd Prem., F. W. Harding	10 00

Flock.

1st Prem., F. W. Harding	$25 00
2nd Prem., Lewis Bros	15 00

Pen of four lambs.

1st Prem., N. M. Jewell & Son, Mineral Point, Wis	$25 00

Champion ram any age, Lewis Bros	$20 00
Champion ewe any age, F. W. Harding	20 00

Best pair of lambs.

Prem., N. M. Jewell & Son	$20 00

Specials.

Pen of four lambs.

1st Prem., N. M. Jewell & Son	$20 00

LINCOLN AND LEICESTER.

Ram 2 years old or over.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Alex W. Arnold	5 00

Ram 1 year and under 2.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00

Ram under 1 year.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Alex W. Arnold	5 00

Ewe 2 years old or over.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Alex W. Arnold	5 00

Ewe 1 year and under 2.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Alex W. Arnold	5 00

Ewe under 1 year.

1st Prem., Alex W. Arnold	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Alex W. Arnold	5 00

Flock.

1st Prem., Alex W. Arnold	$15 00

Pen of four lambs.

1st Prem., Alex W. Arnold	$15 00

Champion ram any age, Alex W. Arnold	$15 00
Champion ewe any age, Alex W. Arnold	15 00

Best pair of lambs.

Prem., Alex W. Arnold	$10 00

CHEVIOT.

Ram 2 years old or over.

1st Prem., Geo. W. Parnell, Wingate, Ill.	$15 00
2nd Prem., Geo. W. Parnell	10 00
3rd Prem., Gilbert Horton, Lodi, Wis.	5 00

Ram 1 year and under 2.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Geo. W. Parnell	10 00
3rd Prem., Geo. W. Parnell	5 00

Ram under 1 year.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Geo. W. Parnell	10 00
3rd Prem., Alex W. Arnold	5 00

Ewe 2 years old or over.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Gilbert Horton	5 00

Ewe 1 year and under 2.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Geo. W. Parnell	10 00
3rd Prem., Alex W. Arnold	5 00

Ewe under 1 year.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Gilbert Horton	10 00
3rd Prem., Alex W. Arnold	5 00

Flock.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Alex W. Arnold	10 00
3rd Prem., Gilbert Horton	5 00

Pen of four lambs.

1st Prem., Geo. W. Parnell	$15 00
2nd Prem., Gilbert Horton	10 00
3rd Prem., Alex W. Arnold	5 00

Champion ram any age, Geo. W. Parnell	$15 00
Champion ewe any age, Geo. W. Parnell	15 00

Best pair of lambs.

Prem., Gilbert Horton	$10 00

HORNED DORSET.

Ram 1 year and under 2.

1st Prem., F. W. Harding	$15 00
2nd Prem., Spring Brook Stock Farm, Arlington Heights, Ill.	10 00

Ram under 1 year.

1st Prem., Spring Brook Stock Farm	$15 00
2nd Prem., Spring Brook Stock Farm	10 00

Ewe 2 years old or over.

1st Prem., Spring Brook Stock Farm	$15 00
2nd Prem., Spring Brook Stock Farm	10 00

Ewe 1 year and under 2.

1st Prem., F. W. Harding	$15 00
2nd Prem., Spring Brook Stock Farm	10 00
3rd Prem., Spring Brook Stock Farm	5 00

Ewe under 1 year.

1st Prem., Spring Brook Stock Farm	$15 00
2nd Prem., Spring Brook Stock Farm	10 00

Flock.

1st Prem., Spring Brook Stock Farm	$15 00

Pen of four lambs.

1st Prem., Spring Brook Stock Farm	$15 00

Champion ram any age, F. W. Harding	$15 00
Champion ewe any age, F. W. Harding	15 00

RAMBOUILLET.

Ram 2 years old or over.

1st Prem., Max Chapman, Marysville, Ohio	$15 00
2nd Prem., E. M. Moore, Orchard Lake, Mich.	10 00
3rd Prem., E. M. Moore	5 00

Ram 1 year and under 2.

1st Prem., E. M. Moore	$15 00
2nd Prem., E. M. Moore	10 00

Ram under 1 year.

1st Prem., E. M. Moore	$15 00
2nd Prem., E. M. Moore	10 00
3rd Prem., Max Chapman	5 00

Ewe 2 years old or over.

1st Prem., Max Chapman	$15 00
2nd Prem., E. M. Moore	10 00
3rd Prem., E. M. Moore	5 00

Ewe 1 year and under 2.

1st Prem., E. M. Moore	$15 00
2nd Prem., Max Chapman	10 00
3rd Prem., E. M. Moore	5 00

Ewe under 1 year.

1st Prem., E. M. Moore	$15 00
2nd Prem., Max Chapman	10 00
3rd Prem., E. M. Moore	5 00

Flock.

1st Prem., Max Chapman	$15 00
2nd Prem., E. M. Moore	10 00

Pen of four lambs.

1st Prem., E. M. Moore	$15 00
2nd Prem., Max Chapman	10 00

Champion ram any age, Max Chapman	$15 00
Champion ewe any age, Max Chapman	15 00

AMERICAN OR DELAINE MERINO.

Ram 2 years old or over.

1st Prem., Uriah Cook & Sons, Chippewa Falls, Wis.	$15 00
2nd Prem., Uriah Cook & Sons	10 00
3rd Prem., E. M. Moore	5 00

Ram 1 year and under 2.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., Uriah Cook & Sons	10 00
3rd Prem., E. M. Moore	5 00

Ram under 1 year.

1st Prem., E. M. Moore	$15 00
2nd Prem., Uriah Cook & Sons	10 00
3rd Prem., Uriah Cook & Sons	5 00

Ewe 2 years old or over.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., Uriah Cook & Sons	10 00
3rd Prem., E. M. Moore	5 00

Ewe 1 year and under 2.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., Uriah Cook & Sons	10 00
3rd Prem., H. E. Moore, Orchard Lake, Mich	5 00

Ewe under 1 year.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., H. E. Moore	10 00
3rd Prem., Uriah Cook & Sons	5 00

Flock.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., E. M. Moore	10 00
3rd Prem., E. M. Moore	5 00

Pen of four lambs.

1st Prem., Uriah Cook & Sons	$15 00
2nd Prem., E. M. Moore	10 00
3rd Prem., S. Ellis, Chippewa Falls, Wis	5 00

Champion ram any age, Uriah Cook & Sons	$15 00
Champion ewe any age, Uriah Cook & Sons	5 00

Best pair of lambs.

Prem., S. Ellis	$10 00

ANGORA GOATS.

Buck 2 years old or over.

1st Prem., Geo. A. Phillippi, Welcome, Wis	$5 00
2nd Prem., Geo. A. Phillippi	3 00
3rd Prem., Geo. A. Phillippi	1 00

Buck 1 year and under

1st Prem., J. McD. Randles, Waukesha, W

2nd Prem., Geo. A. Phillippi..................

3rd Prem., Geo. A. Phillippi..................

Buck kid.

1st Prem., Geo. A. Phillippi..................

2nd Prem., Geo. A. Phillippi..................

3rd Prem., Geo. A. Phillippi..................

Doe 2 years old or ove

1st Prem., Geo. A. Phillippi..................

2nd Prem., Geo. A. Phillippi..................

3rd Prem., Geo. A. Phillippi..................

Doe 1 year and under

1st Prem., Geo. A. Phillippi..................

2nd Prem., Geo. A. Phillippi..................

3rd Prem., Geo. A. Phillippi..................

Doe kid.

1st Prem., Geo. A. Phillippi..................

2nd Prem., Geo. A. Phillippi..................

3rd Prem., Geo. A. Phillippi..................

Breeders' Flock.

1st Prem., Geo. A. Phillippi..................

The Silver Cup offered by the American Ar
sociation for "Best Breeders' Flock" was wo
Welcome, Wis.

UofM

SWINE.

Judge.

N. H. Gentry, Sedalia, Mo.

POLAND CHINA.

Boar 2 years old or over.

1st Prem.,	Heck Bros., Lyons, Wis.	$15 00
2nd Prem.,	Bishop & Esterly, Whitwater, Wis.	10 00
3rd Prem.,	Marinette County Insane Asylum, Peshtigo, Wis.	7 00

Boar 1 year and under 2.

1st Prem.,	W. G. Bartholf, Burlington, Wis.	$15 00
2nd Prem.,	Geo. Martin, Darlington, Wis.	10 00
3rd Prem.,	Heck Bros	7 00

Boar over 6 mos. under 1 year.

1st Prem.,	Geo. Martin	$15 00
2nd Prem.,	William Stude, Mineral Point, Wis.	10 00
3rd Prem.,	L. P. Martiny	7 00

Boar under 6 mos.

1st Prem.,	L. P. Martiny	$12 00
2nd Prem.,	Marinette County Insane Asylum	8 00
3rd Prem.,	Bishop & Esterly	6 00

Sow 2 years old or over.

1st Prem.,	Geo. Martin	$15 00
2nd Prem.,	Marinette County Insane Asylum	10 00
3rd Prem.,	W. G. Bartholf	7 00

Sow 1 year and under 2.

1st Prem.,	L. P. Martiny	$15 00
2nd Prem.,	Geo. Martin	10 00
3rd Prem.,	Geo. Martin	7 00

Sow over 6 mos. under 1 year.

1st Prem., L. P. Martiny............................
2nd Prem., Marinette County Insane Asylum.........
3rd Prem., Marinette County Insane Asylum.........

Sow under 6 mos.

1st Prem., Marinette County Insane Asylum.........
2nd Prem., M. W. Reed, Whitewater, Wis..........
3rd Prem., Marinette County Insane Asylum.........

Get of sire.

1st Prem., L. P. Martiny............................
2nd Prem., Geo. Martin...............................
3rd Prem., Geo. Martin...............................

Produce of sow.

1st Prem., Marinette County Insane Asylum.........
2nd Prem., Geo. Martin...............................

Aged herd.

1st Prem., Geo. Martin...............................
2nd Prem., W. G. Bartholf..........................
3rd Prem., D. C. Patton, Juda, Wis................

Young herd.

1st Prem., Geo. Martin...............................
2nd Prem., L. P. Martiny............................
3rd Prem., Marinette County Insane Asylum.........

Champion boar, Heck Bros...........................
Champion sow, L. P. Martiny.........................

Specials.

Boar over 6 mos. under 1 year.

1st Prem., Geo. Martin...............................
2nd Prem., L. P. Martiny............................
3rd Prem., Marinette County Insane Asylum.........
4th Prem., Heck Bros.................................
5th Prem., Geo. Martin...............................

Boar under 6 mos.

1st Prem., L. P. Martiny............................
2nd Prem., Marinette County Insane Asylum.........
3rd Prem., Bishop & Esterly..........................
4th Prem., J. L. Jones & Son, Leon, Wis............
5th Prem., J. L. Jones & Son..........................

Sow over 6 mos. under 1 year.

1st Prem., L. P. Martiny	$15 00
2nd Prem., Marinette County Insane Asylum	12 00
3rd Prem., Marinette County Insane Asylum	9 00
4th Prem., Geo. Martin	6 00
5th Prem., D. C. Patton	4 00

Sow under 6 months.

1st Prem., Marinette County Insane Asylum	$15 00
2nd Prem., M. W. Reed	12 00
3rd Prem., Heck Bros	9 00
4th Prem., L. P. Martiny	6 00
5th Prem., L. P. Martiny	4 00

3 sows over 1 year.

1st Prem., Geo. Martin	$8 00
2nd Prem., W. G. Bartholf	5 00

BERKSHIRE.

Boar 2 years or over.

1st Prem., F. H. Meekin & Son, Fond du Lac, Wis	$15 00
2nd Prem., H. P. West, Ripon, Wis	10 00

Boar 1 year and under 2.

1st Prem., Geo. E. Kelly, Mineral Point, Wis	$15 00
2nd Prem., Geo. E. Kelly	10 00
3rd Prem., H. P. West	7 00

Boar over 6 mos. under 1 year.

1st Prem., H. C. Taylor, Orfordville, Wis	$15 00
2nd Prem., C. Tochterman, Monroe, Wis	10 00
3rd Prem., F. H. Meekin & Son	5 00

Boar under 6 months.

1st Prem., H. C. Taylor	$12 00
2nd Prem., J. B. Atwood & Son, Roscoe, Ill	8 00
3rd Prem., H. C. Taylor	6 00

Sow 2 years old or over.

1st Prem., J. B. Atwood & Son	$15 00
2nd Prem., C. Tochterman	10 00
3rd Prem., H. P. West	7 00

Sow 1 year and under 2.

1st Prem., J. B. Atwood & Son.................

2nd Prem., Geo. E. Kelly.......................

3rd Prem., H. P. West..........................

Sow over 6 mos. under 1 ye

1st Prem., H. C. Taylor........................

2nd Prem., C. Tochterman.......................

3rd Prem., H. C. Taylor........................

Sow under 6 months.

1st Prem., H. C. Taylor........................

2nd Prem., J. B. Atwood & Son..................

3rd Prem., F. H. Meekin & Son..................

Get of sire.

1st Prem., H. C. Taylor........................

2nd Prem., C. Tochterman.......................

3rd Prem., J. B. Atwood & Son..................

Produce of sow.

1st Prem., J. B. Atwood & Son..................

2nd Prem., Geo. E. Kelly.......................

3rd Prem., H. P. West..........................

Aged herd.

1st Prem., J. B. Atwood & Son..................

2nd Prem., Geo. E. Kelly.......................

3rd Prem., H. P. West..........................

Young herd.

1st Prem., H. C. Taylor........................

2nd Prem., C. Tochterman.......................

3rd Prem., J. B. Atwood & Son..................

Champion boar, H. C. Taylor....................

Champion sow, H. C. Taylor.....................

Specials.

Boar 1 year and under 2.

1st Prem., F. H. Meekin & Son..................

2nd Prem., Geo. E. Kelly.......................

3rd Prem., Geo. E. Kelly.......................

The Money Makers.

Boar under 6 months.

1st Prem., H. C. Taylor	$10 00
2nd Prem., F. H. Meekin & Son	8 00
3rd Prem., H. P. West	5 00
4th Prem., Chas. Roethel & Son, Kiel, Wis	3 00

Sow 1 year old or over.

1st Prem., C. Tochterman	$15 00
2nd Prem., Geo. E. Kelly	12 00
3rd Prem., H. P. West	8 00

Sow under 6 months.

1st Prem., H. C. Taylor	$10 00
2nd Prem., Chas. Roethel & Son	8 00
3rd Prem., F. H. Meekin & Son	5 00
4th Prem., H. P. West	3 00

Herd.

1st Prem., H. C. Taylor	Silver Cup
2nd Prem., C. Tochterman	15 00
3rd Prem., Geo. E. Kelly	10 00
4th Prem., Chas. Roethel & Son	5 00

CHESTER-WHITE.

Boar 2 years old or over.

1st Prem., Humbert & White, Nashua, Ia	$15 00
2nd Prem., W. W. Vaughn & Son, Lyons, Wis	10 00
3rd Prem., Humbert & White	7 00

Boar 1 year and under 2.

1st Prem., Humbert & White	$15 00
2nd Prem., W. W. Vaughn & Son	10 00
3rd Prem., Humbert & White	7 00

Boar over 6 mos. under 1 year.

1st Prem., Humbert & White	$15 00
2nd Prem., Humbert & White	10 00
3rd Prem., W. E. Palmer, Elkhorn, Wis	7 00

Boar under 6 months.

1st Prem., Humbert & White....................
2nd Prem., W. E. Palmer.......................
3rd Prem., W. E. Palmer.......................

Sow 2 years old or over.

1st Prem., Humbert & White....................
2nd Prem., Humbert & White....................
3rd Prem., W. W. Vaughn & Son................

Sow 1 year and under 2.

1st Prem., Humbert & White....................
2nd Prem., Humbert & White....................
3rd Prem., Humbert & White....................

Sow over 6 mos. under 1 year.

1st Prem., Humbert & White....................
2nd Prem., Humbert & White....................
3rd Prem., W. E. Palmer.......................

Sow under 6 months.

1st Prem., W. E. Palmer.......................
2nd Prem., W. E. Palmer.......................
3rd Prem., W. E. Palmer.......................

Get of sire.

1st Prem., Humbert & White....................
2nd Prem., Humbert & White....................
3rd Prem., W. E. Palmer.......................

Produce of sow.

1st Prem., W. E. Palmer.......................
2nd Prem., Humbert & White....................
3rd Prem., W. W. Vaughn & Son................

Aged herd.

1st Prem., Humbert & White....................
2nd Prem., Humbert & White....................
3rd Prem., W. W. Vaughn & Son................

Young herd.

1st Prem., Humbert & White....................
2nd Prem., W. E. Palmer.......................
3rd Prem., W. W. Vaughn & Son................

Champion boar, Humbert & White................
Champion sow, Humbert & White.................

LARGE YORKSHIRES.

Boar 2 years old or over.

1st Prem., B. F. Davidson, Menlo, Ia	$15 00

Boar 1 year and under 2.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00

Boar over 6 mos. under 1 year.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00

Boar under 6 months.

1st Prem., B. F. Davidson	$12 00
2nd Prem., B. F. Davidson	8 00
3rd Prem., B. F. Davidson	6 00

Sow 2 years old or over.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00
3rd Prem., B. F. Davidson	7 00

Sow 1 year and under 2.

1st Prem., B. F. Davidson	$15 00

Sow over 6 mos. under 1 year.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00
3rd Prem., B. F. Davidson	7 00

Sow under 6 months.

1st Prem., B. F. Davidson	$12 00
2nd Prem., B. F. Davidson	8 00
3rd Prem., B. F. Davidson	6 00

Get of sire.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00

Aged herd.

1st Prem., B. F. Davidson	$15 00

Young herd.

1st Prem., B. F. Davidson	$15 00
2nd Prem., B. F. Davidson	10 00

Champion boar, B. F. Davidson	$15 00
Champion sow, B. F. Davidson	15 00

DUROC-JERSEY.

Boar 2 years old or over.

1st Prem., W. G. Bartholf, Burlington, Wis	$15 00
2nd Prem., W. H Reed, Whitewater, Wis	10 00
3rd Prem., Balmat & Son, Mason City, Ia.	7 00

Boar 1 year and under 2.

1st Prem., F. H. Patten, Lyons, Wis	$15 00
2nd Prem., Eli Crall & Son, Evansville, Wis	10 00
3rd Prem., W. W. Vaughn & Son, Lyons, Wis	7 00

Boar over 6 mos. under 1 year.

1st Prem., W. H. Reed	$15 00
2nd Prem., Fred Southcott, Wauwatosa, Wis	10 00
3rd Prem., Balmat & Son	7 00

Boar under 6 months.

1st Prem., W. H. Reed	$12 00
2nd Prem., Balmat & Son	8 00
3rd Prem., Balmat & Son	6 00

Sow 2 years old or over.

1st Prem., W. H. Reed	$15 00
2nd Prem., Balmat & Son	10 00
3rd Prem., W. G. Bartholf	7 00

Sow 1 year and under 2.

1st Prem., Balmat & Son	$15 00
2nd Prem., W. H. Reed	10 00
3rd Prem., Geo. Martin, Darlington, Wis	7 00

Sow over 6 mos. under 1 year.

1st Prem., Balmat & Son	$15 00
2nd Prem., W. H. Reed	10 00
3rd Prem., W. W. Vaughn & Son	7 00

Sow under 6 months.

1st Prem., Balmat & Son	$12 00
2nd Prem., Balmat & Son	8 00
3rd Prem., F. H. Patten, Lyons, Wis	6 00

Get of sire.

1st Prem., Balmat & Son	$15 00
2nd Prem., W. H. Reed	10 00
3rd Prem., W. H. Reed	7 00

Produce of sow.

1st Prem., Balmat & Son	$15 00
2nd Prem., F. H. Patten	10 00
3rd Prem., Geo. Martin	7 00

Aged herd.

1st Prem., W. H. Reed	$15 00
2nd Prem., Balmat & Son	10 00
3rd Prem., W. G. Bartholf	7 00

Young herd.

1st Prem., W. H. Reed	$15 00
2nd Prem., Balmat & Son	10 00
3rd Prem., W. W. Vaughn & Son	7 00

Champion boar, W. G. Bartholf	$15 00
Champion sow, Balmat & Son	15 00

TAMWORTH.

Boar 2 years old or over.

1st Prem., Jas. P. McCollom, Ferris, Ill	$15 00
2nd Prem., Jas. P. McCollom	10 00
3rd Prem., C. C. Roup, Iowa City, Ia	7 00

Boar 1 year and under 2.

1st Prem., Jas. P. McCollom	$15 00
2nd Prem., A. N. Kelly, Mineral Point, Wis	10 00
3rd Prem., Jas. P. McCollom	7 00

Boar over 6 mos. under 1 year.

1st Prem., C. C. Roup	$15 00
2nd Prem., C. C. Roup	10 00
3rd Prem., J. W. Justice, Kalona, Ia	7 00

Boar under 6 months.

1st Prem., J. W. Justice........................
2nd Prem., C. C. Roup..........................
3rd Prem., Jas. P. McCollom....................

Sow 2 years old or over.

1st Prem., C. C. Roup..........................
2nd Prem., Jas. P. McCollom....................
3rd Prem., J. W. Justice........................

Sow 1 year and under 2.

1st Prem., Jas. P. McCollom....................
2nd Prem., Jas. P. McCollom....................
3rd Prem., J. W. Justice........................

Sow over 6 mos. under 1 yea

1st Prem., Jas. P. McCollom....................
2nd Prem., J. W. Justice........................
3rd Prem., C. C. Roup..........................

Sow under 6 months.

1st Prem., C. C. Roup..........................
2nd Prem., Jas. P. McCollom....................
3rd Prem., J. W. Justice........................

Get of sire.

1st Prem., Jas. P. McCollom....................
2nd Prem., C. C. Roup..........................
3rd Prem., J. W. Justice........................

Produce of sow.

1st Prem., C. C. Roup..........................
2nd Prem., Jas. P. McCollom....................
3rd Prem., J. W. Justice........................

Aged herd.

1st Prem., Jas. P. McCollom....................
2nd Prem., J. W. Justice........................
3rd Prem., C. C. Roup..........................

Young herd.

1st Prem., C. C. Roup..........................
2nd Prem., Jas. P. McCollom....................
3rd Prem., J. W. Justice........................

Champion boar, Jas. P. McCollom	$15 00
Champion sow, C. C. Roup	15 00

ALL OTHER DISTINCT BREEDS.

Boar 2 years old or over.

1st **Prem.**, H. P. West, Ripon, Wis	$15 00
2nd **Prem.**, Geo. Ineichen & Son, Geneva, Ind	10 00
3rd **Prem.**, H. P. West	7 00

Boar 1 year and under 2.

1st **Prem.**, H. P. West	$15 00
2nd **Prem.**, Chas. T. Hill, Brookfield, Wis	10 00
3rd **Prem.**, Geo. Ineichen & Son	7 00

Boar over 6 mos. under 1 year.

1st **Prem.**, H. P. West	$15 00
2nd **Prem.**, H. P. West	10 00
3rd **Prem.**, Geo. Ineichen & Son	7 00

Boar under 6 months.

1st **Prem.**, Geo. Ineichen & Son	$12 00
2nd **Prem.**, H. P. West	8 00
3rd **Prem.**, H. P. West	6 00

Sow 2 years old or over.

1st **Prem.**, H. P. West	$15 00
2nd **Prem.**, Geo. Ineichen & Son	10 00
3rd **Prem.**, R. L. Bollman, Coal Valley, Ill	7 00

Sow 1 year and under 2.

1st **Prem.**, H. P. West	$15 00
2nd **Prem.**, Geo. Ineichen & Son	10 00
3rd **Prem.**, R. L. Bollman	7 00

Sow over 6 mos. under 1 year.

1st Prem., H. P. West	$15 00
2nd Prem., H. P. West	10 00
3rd Prem., R. L. Bollman	7 00

Sow under 1 year.

1st Prem., H. P. West	$12 00
2nd Prem., Geo. Ineichen & Son	8 00
3rd Prem., H. P. West	6 00

Get of sire.

1st Prem., H. P. West..........................
2nd Prem., Geo. Ineichen & Son..................
3rd Prem., R. L. Bollman........................

Produce of sow.

1st Prem., Chas. T. Hill........................
2nd Prem., H. P. West...........................
3rd Prem., Geo. Ineichen & Son..................

Aged herd.

1st Prem., H. P. West...........................
2nd Prem., Geo. Ineichen & Son..................
3rd Prem., R. L. Bollman........................

Young herd.

1st Prem., H. P. West...........................
2nd Prem., Geo. Ineichen & Son..................
3rd Prem., R. L. Bollman........................

Champion boar, H. P. West.......................
Champion sow, H. P. West........................

WISCONSIN SWEEPSTAKES

Exhibitor's herd.

1st Prem., W. H. Reed...........................
2nd Prem., Geo. Martin..........................
3rd Prem., L. P. Martiny........................
4th Prem., Marinette County Insane Asylum......

WISCONSIN SWINE BREEDERS' ASSOCIA

Poland China, L. P. Martiny.....................
Berkshire, H. C. Taylor.........................
Chester-White, Humbert & White..................
Larke Yorkshire, B. F. Davidson.................
Duroc-Jersey, W. H. Reed........................
Tamworth, J. W. Justice.........................
All other distinct breeds, H. P. West...........

POULTRY DIVISION.

Judge.

D. T. Heimlich, Jacksonville, Ill.

Barred Plymouth Rock.

Cock.

1st Prem.	E. G. Roberts, Fort Atkinson, Wis	$1 50
2nd Prem.	John Conrad, West Allis, Wis	1 00
3rd Prem.	E. G. Roberts	75

Cockerel.

1st Prem.	Hoyt Co., Whitewater, Wis	$1 50
2nd Prem.	E. G. Roberts	1 00
3rd Prem.	Louis Pierron	75

Hen.

1st Prem.	E. G. Roberts	$1 50
2nd Prem.	E. G. Roberts	1 00
3rd Prem.	Wm. E. Prisk, Mineral Point, Wis	75

Pullet.

1st Prem.	Wm. E. Prisk	$1 50
2nd Prem.	E. G. Roberts	1 00
3rd Prem.	F. Stier, Sussex, Wis	75

White Plymouth Rock.

Cock.

1st Prem.	C. Beerend, Wauwatosa, Wis	$1 50
2nd Prem.	Chas. A. Haney, Wauwatosa, Wis	1 00
3rd Prem.	Francis D. Bancroft, Waukesha, Wis	75

Cockerel.

1st Prem.	Wm. E. Prisk	$1 50
2nd Prem.	Wm. E. Prisk	1 00
3rd Prem.	C. Beerend	75

Hen.

1st Prem., C. Beerend..........................
2nd Prem., Chas. A. Haney......................
3rd Prem., J. G. Walvoord, Sheboygan, Wis.....

Pullet.

1st Prem., Pasbrig Bros., Wauwatosa, Wis.....
2nd Prem., J. G. Walvoord......................
3rd Prem., Chas. W. Dedricks, Wauwatosa, Wis

Buff Plymouth Rock.

Cock.

1st Prem., Mrs. Ethel Nelson, Columbus, Wis...
2nd Prem., E. G. Roberts........................
3rd Prem., A. H. Kittinger, Caledonia, Wis......

Cockerel.

1st Prem., A. H. Kittinger......................
2nd Prem., A. H. Kittinger......................
3rd Prem., Mrs. Ethel Nelson...................

Hen.

1st Prem., Mrs. Ethel Nelson...................
2nd Prem., E. G. Roberts........................
3rd Prem., J. R. Love, Waukesha, Wis...........

Pullet.

1st Prem., A. H. Kittinger......................
2nd Prem., E. G. Roberts........................
3rd Prem., Louis Pierron Co.....................

Golden Wyandotte.

Cock.

1st Prem., E. G. Roberts........................
2nd Prem., Klose & Ueberall, Milwaukee, Wis....
3rd Prem., Pasbrig Bros.........................

Cockerel.

1st Prem., E. G. Roberts........................
2nd Prem., Mrs. Josie Kazolka, Milwaukee, Wis..

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Klose & Ueberall	1 00
3rd Prem., Mrs. Josie Kazolka	75

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Mrs. Josie Kazolka	1 00
3rd Prem., Mrs. Josie Kazolka	75

Silver Wyandotte.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., W. F. & L. C. Rippert, Burlington, Ia	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., W. E. Palmer, Elkhorn, Wis	1 00
3rd Prem., Hoyt Co	75

Hen.

1st Prem., W. F. & L. S. Rippert	$1 50
2nd Prem., Aug. Dobberphul, Milwaukee, Wis	1 00
3rd Prem., Klose & Ueberall	75

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., W. E. Palmer	1 00
3rd Prem., Hoyt Co	75

Buff Wyandotte.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., J. R. Love	1 00
3rd Prem., Aug. Dobberphul	75

Cockerel.

1st Prem., J. R. Love	$1 50
2nd Prem., J. R. Love	1 00
3rd Prem., Hoyt Co	75

Hen.

1st Prem., J. R. Love	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., Pasbrig Bros	75

Pullet.

1st Prem., J. R. Love	$1 50
2nd Prem., J. R. Love	1 00
3rd Prem., Pasbrig Bros	75

White Wyandotte.

Cock.

1st Prem., Aug. Dobberphul	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Aug. Dobberphul	75

Cockerel.

1st Prem., Pasbrig Bros	$1 50
2nd Prem., Olaf P. Olson, Wauwatosa, Wis	1 00
3rd Prem., Harry Marks, Whitewater, Wis	75

Hen.

1st Prem., Chas. Christensen, Manitowoc, Wis	$1 50
2nd Prem., Chas. Christensen	1 00
3rd Prem., Aug. Dobberphul	75

Pullet.

1st Prem., Wm. E. Prisk	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Wm. E. Prisk	75

Black Wyandotte.

Cock.

1st Prem., Pasbrig Bros	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Pasbrig Bros	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Pasbrig Bros	1 00
3rd Prem., Pasbrig Bros	Ribbon

Hen.

1st Prem., Pasbrig Bros	$1 50
2nd Prem., Fountain City Poultry Yards, Fond du Lac, Wis.	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Pasbrig Bros	1 00
3rd Prem., Pasbrig Bros	Ribbon

Partridge Wyandotte.

Cock.

1st Prem., R. J. Sawyer, Menominee, Mich	$1 50
2nd Prem., Pasbrig Bros	1 00
3rd Prem., Pasbrig Bros	Ribbon

Hen.

1st Prem., R. J. Sawyer	$1 50
2nd Prem., C. E. Judson, Wauwatosa, Wis	1 00
3rd Prem., C. E. Judson	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Aug. Dobberphul	1 00

Mottled or Black Java.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Pasbrig Bros	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., Pasbrig Bros	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Colored or Silver Gray Dorking.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Buff Orpington.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., C. E. Potter, Elkhorn, Wis	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., C. E. Potter	1 00

Hen.

1st Prem., Hoyt Company	$1 50
2nd Prem., Hoyt Company	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., C. E. Potter	1 00
3rd Prem., C. E. Potter	Ribbon

White or Black Orpington.

Cock.

1st Prem., Mrs. Ethel Nelson	$1 50
2nd Prem., Fountain City Poultry Yards	1 00
3rd Prem., E. G. Roberts	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., F. Stier	1 00
3rd Prem., Fountain City Poultry Yards	Ribbon

Hen.

1st Prem., Mrs. Ethel Nelson	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Fountain City Poultry Yards	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Fountain City Poultry Yards	1 00
3rd Prem., F. Stier	Ribbon

White or Black Langshan.

Cock.

1st Prem., Nowak Bros., Milwaukee, Wis	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Cockerel.

1st Prem., Hoyt Company	$1 50
2nd Prem., Chas. A. Haney	1 00
3rd Prem., E. G. Roberts	Ribbon

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Nowak Bros	1 00
3rd Prem., Nowak Bros	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Chas. A. Haney	1 00
3rd Prem., Hoyt Co	Ribbon

Dark Brahma.

Cock.

1st Prem., John Conrad	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00
3rd Prem., John Conrad	Ribbon

Hen.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00
3rd Prem., John Conrad	Ribbon

Pullet.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00
3rd Prem., John Conrad	Ribbon

Light Brahma.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Nowak Bros	1 00
3rd Prem., Hoyt Co	75

Cockerel.

1st Prem., Theo. Gerlach, Milwaukee, Wis	$1 50
2nd Prem., Theo. Gerlach	1 00
3rd Prem., Theo. Gerlach	75

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Theo. Gerlach	1 00
3rd Prem., Theo. Gerlach	75

Pullet.

1st Prem., Theo. Gerlach	$1 50
2nd Prem., Theo. Gerlach	1 00
3rd Prem., Theo. Gerlach	75

Buff Cochin.

Cock.

1st Prem., Geo. W. Tulenz, Milwaukee, Wis	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., E. G. Roberts	75

Cockerel.

1st Prem., John Conrad	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., John Conrad	75

Hen.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., Geo. W. Tulenz	75

Pullet.

1st Prem., John Conrad	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., John Conrad	75

Partridge Cochin.

Cock.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., Hoyt Co	75

Cockerel.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	75

Hen.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Geo. W. Tulenz	75

Pullet.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	75

White Cochin.

Cock.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., E. G. Roberts	Ribbon

Cockerel.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00

Hen.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., Geo. W. Tulenz	Ribbon

Pullet.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00

Black Cochin.

Cock.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Geo. W. Tulenz	Ribbon

Cockerel.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00

Hen.

1st Prem., Geo. W. Tulenz	$1 50
2nd Prem., Geo. W. Tulenz	1 00
3rd Prem., Geo. W. Tulenz	Ribbon

Pullet.

1st Prem., John Conrad	$1 50
2nd Prem., John Conrad	1 00

Blue Andalusian.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Rhode Island Reds.

Cock.

1st Prem., Walter E. Holmes, Oshkosh, Wis	$1 50
2nd Prem., W. E. Palmer	1 00
3rd Prem., Phil Koch, Janesville, Wis	75

Cockerel.

1st Prem., Phil Koch	$1 50
2nd Prem., Chas. M. Dedricks	1 00
3rd Prem., W. E. Palmer	75

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Walter E. Holmes	1 00
3rd Prem., E. G. Roberts	75

Pullet.

1st Prem., N. E. Palmer	$1 50
2nd Prem., Phil Koch	1 00
3rd Prem., Phil Koch	75

Single Comb Brown Leghorn.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., A. H. McIntire, Sheboygan, Wis	75

Cockerel.

1st Prem., Frank Kittinger, Caledonia, Wis	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., E. G. Roberts	75

Hen.

1st Prem., Aug. Dobberphul	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., A. H. McIntire	75

Pullet.

1st Prem., A. H. McIntire	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., E. G. Roberts	75

Rose Comb Brown Leghorn.

Cock.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., A. H. McIntire	75

Cockerel.

1st Prem., A. H. McIntire	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Aug. Dobberphul	75

Hen.

1st Prem., A. H. McIntire	$1 50
2nd Prem., Louis Pierron Co	1 00
3rd Prem., Pasbrig Bros	75

Pullet.

1st Prem., J. R. Love	$1 50
2nd Prem., A. H. McIntire	1 00
3rd Prem., E. G. Roberts	75

Single Comb White Leghorn.

Cock.

1st Prem., Aug. Dobberphul	$1 50
2nd Prem., Henry Wallschlaeger, Manitowoc, Wis	1 00
3rd Prem., Francis Biedler, Hartland, Wis	75

Cockerel.

1st Prem., J. G. Walvoord	$1 50
2nd Prem., J. G. Walvoord	1 00
3rd Prem., J. G. Walvoord	75

Hen.

1st Prem., A. H. McIntire	$1 50
2nd Prem., Paul Gerhard & Son, N. Milwaukee, Wis	1 00
3rd Prem., Francis Biedler	75

Pullet.

1st Prem., A. H. McIntire	$1 50
2nd Prem., Fountain City Poultry Yards	1 00
3rd Prem., Philip H. Koenig, Milwaukee, Wis	75

Rose Comb White Leghorn.

1st Prem., E. G. Roberts	$1 50
2nd Prem., F. Stier	1 00
3rd Prem., Aug. Dobberphul	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., F. Stier	1 00
3rd Prem., F. Stier	75

Hen.

1st Prem., Aug. Dobberphul	$1 50
2nd Prem., Aug. Dobberphul	1 00
3rd Prem., E. G. Roberts	75

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., F. Stier	1 00
3rd Prem., Aug. Dobberphul	75

Black Leghorn.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

Buff Leghorn.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., H. J. Evans, Racine, Wis	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., H. J. Evans	75

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., H. J. Evans	75

Pullet.

1st Prem., H. J. Evans	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	75

Black Minorca.

Cock.

1st Prem., Henry Wallschlaeger	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., W. E. Palmer	1 00
3rd Prem., Hoyt Co	75

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Henry Wallschlaeger	1 00
3rd Prem., Henry Wallschlaeger	75

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., W. E. Palmer	1 00
3rd Prem., E. G. Roberts	75

Single Comb White Leghorn.

Cock.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Paul Gerhard & Son, N. Milwaukee, Wis	1 00

Hen.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Paul Gerhard & Son	1 00

White Faced Black Spanish.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

Houdan.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

White Polish.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., Hoyt Co	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50

White Crested Black Polish.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

Silver Polish.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Golden Polish.

Cock.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	75

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Con Roelke, Milwaukee, Wis	Ribbon

Black Hamburg.

Cock.

1st Prem.,	Paul Gerhard & Son	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	Hoyt Co	Ribbon

Cockerel.

1st Prem.,	Paul Gerhard & Son	$1 50
2nd Prem.,	Paul Gerhard & Son	1 00
3rd Prem.,	Hoyt Co	Ribbon

Hen.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	Paul Gerhard & Son	1 00
3rd Prem.,	Paul Gerhard & Son	75

Pullet.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	Paul Gerhard & Son	1 00
3rd Prem.,	Paul Gerhard & Son	Ribbon

Silver Spangled Hamburg.

Cock.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	John Luebtow, Milwaukee, Wis	1 00
3rd Prem.,	John Luebtow	Ribbon

Cockerel.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	S. A. Brown & Son, Waterloo, Wis	1 00
3rd Prem.,	S. A. Brown & Son	Ribbon

Hen.

1st Prem.,	John Luebtow	$1 50
2nd Prem.,	S. A. Brown & Son	1 00
3rd Prem.,	John Luebtow	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., S. A. Brown & Son	1 00
3rd Prem., S. A. Brown & Son	Ribbon

Silver Pencilled Hamburg.

Cock.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50

Golden Spangled Hamburg.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00

Pullet.

1st Prem., E. G. Roberts	$1 50

Golden Pencilled Hamburg.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Cornish Indian Game.

Cock.

1st Prem., J. R. Love	$1 50
2nd Prem., A. M. Schulz, Oconomowoc, Wis	1 00
3rd Prem., E. G. Roberts	75

Cockerel.

1st Prem., J. R. Love	$1 50
2nd Prem., J. R. Love	1 00
3rd Prem., A. M. Schulz	75

Hen.

1st Prem., A. M. Schulz	$1 50
2nd Prem., J. R. Love	1 00
3rd Prem., E. G. Roberts	75

Pullet.

1st Prem., J. R. Love	$1 50
2nd Prem., A. M. Schulz	1 00
3rd Prem., J. R. Love	75

Red Pyle Game.

Cock.

1st Prem., Hoyt Co	$1 50

Cockerel.

1st Prem., Hoyt Co	$1 50
2nd Prem., Hoyt Co	1 00

Hen.

1st Prem., Hoyt Co	$1 50

Pullet.

1st Prem., Hoyt Co	$1 50
2nd Prem., Hoyt Co	1 00

Black Breasted Game.

Cock.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

White Indian Game.

Cock.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Silver or Golden Duckwing Bantam.

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Silver Seabright Bantam.

Cock.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	F. Stier	1 00
3rd Prem.,	Francis Biedler	Ribbon

Cockerel.

1st Prem.,	E. G. Roberts	$1 50

Hen.

1st Prem.,	Francis Biedler	$1 50
2nd Prem.,	E. G. Roberts	1 00

Pullet.

1st Prem.,	E. G. Roberts	$1 50

Golden Seabright Bantam.

Cock.

1st Prem.,	F. Stier	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	Hoyt Co	Ribbon

Cockerel.

1st Prem.,	Hoyt Co	$1 50
2nd Prem.,	Hoyt Co	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Hen.

1st Prem.,	Fountain City Poultry Yards	$1 50
2nd Prem.,	F. Stier	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Pullet.

1st Prem.,	Hoyt Co	$1 50
2nd Prem.,	Hoyt Co	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Black Breasted Red Game Bantam.

Cock.

1st Prem.,	F. G. Boots, Sussex, Wis	$1 50
2nd Prem.,	F. G. Boots	1 00
3rd Prem.,	F. G. Boots	Ribbon

Cockerel.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	F. G. Boots	1 00
3rd Prem.,	Hoyt Co	Ribbon

Hen.

1st Prem.,	F. G. Boots	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	F. G. Boots	Ribbon

Pullet.

1st Prem.,	F. G. Boots	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Red Pyle Game Bantam.

Cock.

1st Prem.,	F. G. Boots	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Cockerel.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	F. G. Boots	Ribbon

Hen.

1st Prem.,	Klose & Ueberall	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	F. G. Boots	Ribbon

Pullet.

1st Prem.,	F. G. Boots	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Brown Red Game Bantam.

Cock.

1st Prem., F. G. Boots	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., F. G. Boots	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., F. G. Boots	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Golden Duckwing Game Bantam.

Cock.

1st Prem., Boots & Stier, Sussex, Wis	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., Boots & Stier	$1 50

Hen.

1st Prem., Boots & Stier	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., E. G. Roberts	Ribbon

Silver Duckwing Game Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., Boots & Stier	Ribbon

Hen.

1st Prem., Boots & Stier	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., Boots & Stier	$1 50

White Game Bantam.

Cock.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., Boots & Stier	Ribbon

Partridge Cochin Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Jas. F. Gaffney, Milwaukee, Wis	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Jas. F. Gaffney	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50

Buff Cochin Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., Boots & Stier	Ribbon

Cockerel.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Boots & Stier	Ribbon

Hen.

1st Prem., Klose & Ueberall	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., Boots & Stier	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., E. G. Roberts	Ribbon

White Cochin Bantam.

1st Prem., Boots & Stier	$1 50
2nd Prem., R. W. Boerner, Milwaukee, Wis	1 00
3rd Prem., Boots & Stier	Ribbon

Cockerel.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., R. W. Boerner	Ribbon

Hen.

1st Prem.,	Dalley & Beantow, Milwaukee, Wis	$1 50
2nd Prem.,	Boots & Stier	1 00
3rd Prem.,	Knoerschild & Dierckmeyer, Milwaukee, Wis	Ribbon

Pullet.

1st Prem.,	Knoerschild & Dierckmeyer	$1 50
2nd Prem.,	Boots & Stier	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Black Cochin Bantam.

Cock.

1st Prem.,	Knoerschild & Dierckmeyer	$1 50
2nd Prem.,	E. G. Roberts	1 00
3rd Prem.,	Knoerschild & Dierckmeyer	Ribbon

Cockerel.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	Knoerschild & Dierckmeyer	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Hen.

1st Prem.,	Fountain City Poultry Yards	$1 50
2nd Prem.,	Knoerschild & Dierckmeyer	1 00
3rd Prem.,	Chas. Christensen	Ribbon

Pullet.

1st Prem.,	Knoerschild & Dierckmeyer	$1 50
2nd Prem.,	Knoerschild & Dierckmeyer	1 00
3rd Prem.,	E. G. Roberts	Ribbon

Black Rose Comb Bantam.

Cock.

1st Prem.,	E. G. Roberts	$1 50
2nd Prem.,	J. J. Rodig, Milwaukee, Wis	1 00
3rd Prem.,	J. J. Rodig	Ribbon

Cockerel.

1st Prem., Hoyt Co	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Hen.

1st Prem., J. J. Rodig	$1 50
2nd Prem., Nowak Bros	1 00
3rd Prem., J. J. Rodig	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., E. G. Roberts	Ribbon

White Japanese Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Hoyt Co	1 00
3rd Prem., Hoyt Co	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Hoyt Co	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., E. G. Roberts	1 00

Black Tailed Japanese Bantam.

Cock.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., Francis Biedler	1 00

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Francis Biedler	1 00
3rd Prem., Boots & Stier	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., Boots & Stier	Ribbon

Light Brahma Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

Dark Brahma Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

Indian Game Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50

Cockerel.

1st Prem., E. G. Roberts	$1 50

Hen.

1st Prem., E. G. Roberts	$1 50

Pullet.

1st Prem., E. G. Roberts	$1 50

Indian Game Bantam.

Cock.

1st Prem., Boots & Stier	$1 50

Hen.

1st Prem., Boots & Stier	$1 50
2nd Prem., Boots & Stier	1 00

Pullet.

1st Prem., Boots & Stier	$1 50

Birchen Game Bantam.

Cock.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00
3rd Prem., E. G. Roberts	Ribbon

Cockerel.

1st Prem., E. G. Roberts	$1 50
2nd Prem., Boots & Stier	1 00

Hen.

1st Prem., Boots & Stier	$1 50
2nd Prem., E. G. Roberts	1 00
3rd Prem., E. G. Roberts	Ribbon

Pullet.

1st Prem., E. G. Roberts	$1 50

Sweepstakes.

American Breeds.

Prem., E. G. Roberts	$15 00

Asiatic Breeds.

Prem., John Conrad	$10 00

Turkeys—Old Birds.

Bronze.

1st Prem., Henry J. Schulte, Wauwautosa, Wis	$3 00

Black.

1st Prem., E. G. Roberts	$3 00

White Holland.

1st Prem., E. G. Roberts	$3 00

Narragansett.

1st Prem., E. G. Roberts	$3 00

Buff.

1st Prem., Orpington View, Columbus, Wis	$3 00

Turkeys—Young Birds.

Bronze.

1st Prem., Henry J. Schulte	$2 50

White Holland.

1st Prem., Dawson Bros., Franksville, Wis	$2 50

Geese—Old Birds.

Toulouse.

1st Prem.,	Dawson Bros	$3 00
2nd Prem.,	E. G. Roberts	2 00
3rd Prem.,	Paul Gerhard & Son	Ribbon

Embden.

1st Prem.,	Highland Poultry Yards, Milwaukee, Wis	$3 00
2nd Prem.,	E. G. Roberts	2 00
3rd Prem.,	Highland Poultry Yards	Ribbon

African.

1st Prem.,	Dawson Bros	$3 00
2nd Prem.,	Dawson Bros	2 00
3rd Prem.,	Dawson Bros	Ribbon

Wild.

1st Prem.,	Dawson Bros	$3 00
2nd Prem.,	Dawson Bros	2 00
3rd Prem.,	Chas. H. Besacker, Delavan, Wis	Ribbon

Chinese White.

1st Prem.,	Dawson Bros	$3 00
2nd Prem.,	Chas. H. Besecker	2 00
3rd Prem.,	E. G. Roberts	Ribbon

Chinese Brown.

1st Prem.,	E. G. Roberts	$3 00
2nd Prem.,	Chas. H. Besecker	2 00
3rd Prem.,	Dawson Bros	Ribbon

Egyptian.

1st Prem.,	Dawson Bros	$3 00

Geese—Young Birds.

Toulouse.

1st Prem.,	Highland Poultry Yards	$2 50
2nd Prem.,	Dawson Bros	1 50
3rd Prem.,	Dawson Bros	Ribbon

Embden.

1st Prem., Highland Poultry Yards	$2 50
2nd Prem., Dawson Bros	1 50
3rd Prem., Dawson Bros	Ribbon

African.

1st Prem., Dawson Bros	$2 50
2nd Prem., Dawson Bros	1 50

Wild.

1st Prem., Dawson Bros	$2 50

Chinese White.

1st Prem., Chas. H. Besecker	$2 50
2nd Prem., Dawson Bros	1 50

Chinese Brown.

1st Prem., Chas. H. Besecker	$2 50

Ducks—Old Birds.

Pekin.

1st Prem., Chas. H. Besecker	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., E. G. Roberts	Ribbon

Aylesbury.

1st Prem., E. G. Roberts	$3 00
2nd Prem., J. R. Love	2 00
3rd Prem., Dawson Bros	Ribbon

Rouen.

1st Prem., Dawson Bros	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., E. G. Roberts	Ribbon

Cayuga.

1st Prem., E. G. Roberts	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., Chas. H, Besecker	Ribbon

East India.

1st Prem., Pasbrig Bros	$3 00
2nd Prem., E. G. Roberts	2 00
3rd Prem., Pasbrig Bros	Ribbon

1st Prem., E. G. Roberts	$3 00
2nd Prem., Chas. H. Besecker	2 00
3rd Prem., Dawson Bros	Ribbon

Colored Muscovy.

1st Prem., E. J. Seyferth, South Milwaukee, Wis	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., Chas. H. Besecker	Ribbon

White Muscovy.

1st Prem., Chas. H. Besecker	$3 00
2nd Prem., E. G. Roberts	2 00
3rd Prem., Dawson Bros	Ribbon

Grey or White Call.

1st Prem., E. G. Roberts	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., E. G. Roberts	Ribbon

White Crested.

1st Prem., Chas. H. Besecker	$3 00
2nd Prem., Dawson Bros	2 00
3rd Prem., E. G. Roberts	Ribbon

Ducks—Young Birds.

Pekin.

1st Prem., Louis Pierron Co	$2 50
2nd Prem., Dawson Bros	1 50
3rd Prem., Dawson Bros	Ribbon

Aylesbury.

1st Prem., Dawson Bros	$2 50
2nd Prem., E. G. Roberts	1 50

Rouen.

1st Prem., John Conrad	$2 50
2nd Prem., E. G. Roberts	1 50
3rd Prem., Dawson Bros	Ribbon

Cayuga.

1st Prem., Dawson Bros	$3 50
2nd Prem., E. G. Roberts	1 50
3rd Prem., Dawson Bros	Ribbon

East India.

1st Prem., Pasbrig Bros	$2 50
2nd Prem., Pasbrig Bros	1 50
3rd Prem., Chas. H. Besecker	Ribbon

Indian Runner.

1st Prem., Chas. H. Besecker	$2 50
2nd Prem., H. J. Evans	1 50
3rd Prem., Dawson Bros	Ribbon

Colored Muscovy.

1st Prem., Dawson Bros	$2 50
2nd Prem., E. G. Roberts	1 50
3rd Prem., E. J. Seyferth	Ribbon

White Muscovy.

1st Prem., Dawson Bros	$2 50
2nd Prem., E. G. Roberts	1 50

Grey or White Call.

1st Prem., E. G. Roberts	$2 50
2nd Prem., Dawson Bros	1 50
3rd Prem., Dawson Bros	Ribbon

White Crested.

1st Prem., Dawson Bros	$2 50
2nd Prem., Chas. H. Besecker	1 50
3rd Prem., E. G. Roberts	Ribbon

Sweepstakes.

Best Exhibit of Water Fowl.

Premium, Dawson Bros	$10 00

Miscellaneous

Guinea fowl, white or pearl.

1st Prem., E. G. Roberts	$3 00
2nd Prem., H. J. Evans	2 00

Silkies, white or black.

1st Prem., E. G. Roberts	$2 00
2nd Prem., E. G. Roberts	1 00

Frizzles, any color.

1st Prem., E. G. Roberts	$2 00
2nd Prem., E. G. Roberts	1 00

Rumpless, any color.

1st Prem., E. G. Roberts	$2 00

Belgian Hares.

Buck 1 year old or over.

1st Prem., Addison Love, Waukesha, Wis	$3 00
2nd Prem., Jos. Volz, Wauwatosa, Wis	2 00

Doe 1 year old or over.

1st Prem., Dally & Trelor, Milwaukee, Wis	$3 00
2nd Prem., Dally or Trelor	2 00

Buck over 6 mos. under 1 year.

1st Prem., F. J. Strathman, Carlyle, Ill	$3 00
2nd Prem., F. J. Strathman	2 00

Doe over 6 mos. under 1 year.

1st Prem., F. J. Strathman	$3 00
2nd Prem., F. J. Strathman	2 00

Doe with litter.

1st Prem., Al. Kroeger, Milwaukee, Wis	$3 00

Flemish Giant or Himalayan Hares.

Buck 1 year old or over.

1st Prem., Dally & Trelor	$3 00
2nd Prem., Al. Kroeger	2 00

Doe 1 year old or over.

1st Prem., Dally & Trelor	$3 00
2nd Prem., Dally & Trelor	2 00

Buck over 6 mos. under 1 year.

1st Prem., Al. Kroeger	$3 00
2nd Prem., Dally & Trelor	2 00

Doe over 6 mos. under 1 year.

1st Prem., Al Kroeger	$3 00
2nd Prem., Dally & Trelor	2 00

Doe with litter.

1st Prem., Al Kroeger	$3 00
2nd Prem., Dally & Trelor	2 00

Any Other Breed of Hares.

Buck 1 year old or over.

1st Prem., Hoyt Co	$3 00
2nd Prem., Robt. E. Haylett, Milwaukee, Wis	2 00

Doe 1 year old or over.

1st Prem., Hoyt Co	$3 00
2nd Prem., Robt. E. Haylett	2 00

Buck over 6 mos. under 1 year.

1st Prem., Al Kroeger	$3 00
2nd Prem., Aug. W. Pollworth, Milwaukee, Wis	2 00

Doe over 6 mos. under 1 year.

1st Prem., Al Kroeger	$3 00
2nd Prem., Aug. W. Pollworth	2 00

Doe with litter.

1st Prem., Hoyt Co	$3 00

Cavies (Guinea Pigs).

English—Smooth.

Boar.

1st Prem., Aug. W. Pollworth	$3 00
2nd Prem., Aug. W. Pollworth	2 00

Sow.

1st Prem., Aug. W. Pollworth	$3 00
2nd Prem., Oscar Huber, Milwaukee, Wis	2 00

Sow with litter.

1st Prem., Oscar Huber	$3 00
2nd Prem., Ferd Vanselow, South Milwaukee, Wis	2 00

Abyssinian.

Boar.

1st Prem., Oscar Huber	$3 00
2nd Prem., Aug. W. Pollworth	2 00

Sow.

1st Prem., Oscar Huber	$3 00
2nd Prem., Aug. W. Pollworth	2 00

Peruvian.

Boar.

1st Prem., Oscar Huber	$3 00
2nd Prem., H. R. Brown, Milwaukee, Wis	2 00

Sow.

1st Prem., Aug. W. Pollworth	$3 00
2nd Prem., H. R. Brown	2 00

PIGEON DIVISION.

Judge.

William Plaehn, Chicago, Ill.

Single Birds—Old.

Carriers.

Black cock.

1st Prem., H. C. Schmitt, Milwaukee, Wis	$1 00
2nd Prem., Hoyt Co., Whitewater, Wis	50

Dun cock.

1st Prem., Herman Kretschmer, Chicago, Ill	$1 00
2nd Prem., Geo. Ewald, Cincinnati, O	50

White cock.

1st Prem., Herman Kretschmer	$1 00

Any other color cock.

1st Prem., Herman Kretschmer	$1 00
2nd Prem., H. C. Schmitt	50

Black hen.

1st Prem., H. C. Schmitt	$1 00

Dun hen.

1st Prem., Geo. Ewald	$1 00

White hen.

1st Prem., Herman Kretschmer	$1 00
2nd Prem., Hoyt Co	50

Any other color hen.

1st Prem., Herman Kretschmer	$1 00
2nd Prem., Herman Kretschmer	50

Pouters.

Black pied cock.

1st Prem., Oscar Buxbaum, Milwaukee, Wis	1 00
2nd Prem., Geo. Ewald	50

Blue pied cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Red pied cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Yellow pied cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

White cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Any other cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Black pied hen.

1st Prem., Oscar Buxbaum	$1 00
2nd Prem., Geo. Ewald	50

Blue pied hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Red pied hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Yellow pied hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

White hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Oscar Buxbaum	50

Any other color hen.

1st Prem., Geo. Ewald	$1 00

Pouters—Pigmies.

Black cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Blue cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

White cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Any other color cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Black hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Blue hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

White hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Any other color hen.

1st Prem., Geo. Ewald	$1 00

Brunner Pouters.

Blue cock.

1st Prem., Geo. Ewald	$1 00

Black cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Herman Kretschmer	50

Any other color cock.

1st Prem., William Korb, Milwaukee, Wis	$1 00
2nd Prem., Geo. Ewald	50

Blue hen.

1st Prem., Geo. Ewald	$1 00

Black hen.

1st Prem., Herman Kretschmer	$1 00
2nd Prem., Geo. Ewald	50

Any other color hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., William Korb	50

Saddle-back Fantails.

Black cock.

1st Prem., Geo. Ewald	$1 00

Any other color cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Black hen.

1st Prem., Geo. Ewald	$1 00

Any other color hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Tail-Colored Fantails.

Any other color cock.

1st Prem., William Korb	$1 00
2nd Prem., William Korb	50

Any color hen.

1st Prem., William Korb	$1 00
2nd Prem., William Korb	50

Fantails—Plain.

Black cock.

1st Prem., Geo. Ewald	$1 00

Blue cock.

1st Prem., Geo. Ewald	$1 00

Red cock.

1st Prem., Geo. Ewald	$1 00

Yellow cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

White cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Jos. K. Barta, Jr., Milwaukee, Wis	50

Any other color cock.

1st Prem., Geo. Ewald	$1 00

Black hen.

1st Prem., Geo. Ewald	$1 00

Blue hen.

1st Prem., Geo. Ewald	$1 00

Red hen.

1st Prem., Geo. Ewald	$1 00

Yellow hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

White hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Geo. Ewald	50

Any other color hen.

1st Prem., Geo. Ewald	$1 00

Magpies.

Red cock.

1st Prem., Geo. Ewald	$1 00
2nd Prem., G. R. Schubert, Milwaukee, Wis	50

Yellow cock.

1st Prem., Geo. Ewald	$1 00

Black cock.

1st Prem., Geo. Ewald	$1 00

Blue cock.

1st Prem., Geo. Ewald	$1 00

Any other color cock.

1st Prem., Geo. Ewald	$1 00

Red hen.

1st Prem., G. R. Schubert	$1 00
2nd Prem., Geo. Ewald	50

Yellow hen.

1st Prem., Geo. Ewald	$1 00

Black hen.

1st Prem., Geo. Ewald	$1 00
2nd Prem., Mrs. E. Reuter, Milwaukee, Wis	50

Blue hen.

1st Prem., Geo. Ewald	$1 00

An other color hen.

1st Prem., Geo. Ewald	$1 00

Pigeons Shown in Pairs.

Hen Pigeons.

Black.

1st Prem., John Kazolka, Milwaukee, Wis	$2 00
2nd Prem., G. R. Schubert	1 00

Blue.

1st Prem., G. R. Schubert	$2 00
2nd Prem., G. R. Schubert	1 00

White.

1st Prem., G. R. Schubert	$2 00
2nd Prem., John Kazolka	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., G. R. Schubert	1 00

Barbs.

Red.

1st Prem., Herman Vanselow, South Milwaukee, Wis	$2 00
2nd Prem., Herman Vanselow	1 00

Black.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Any other color.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Jacobims.

Red.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Yellow.

1st Prem., John Kazolka	$2 00
2nd Prem., Geo. Ewald	1 00

Black.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Herman Kretschmer	1 00

White.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Oriental Frills.

Blondettes—blue lace.

1st Prem., Dr. J. F. Roe, Milwaukee, Wis	$2 00
2nd Prem., Herman Vanselow	1 00

Blondettes—black lace.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Herman Vanselow	1 00

Blondettes—blue bow.

1st Prem., Dr. J. F. Roe	$2 00
2nd Prem., Herman Vanselow	1 00

Satinettes.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Bluettes.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Dr. J. F. Roe	1 00

Any other color.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Turbits—Wing.

Red.

1st Prem.,	Geo. Ewald	$2 00
2nd Prem.,	Geo. Ewald	1 00

Yellow.

1st Prem.,	Geo. Ewald	$2 00
2nd Prem.,	Thomas B. McCauley, Chicago, Ill.	1 00

Black.

1st Prem.,	Thomas B. McCauley	$2 00
2nd Prem.,	Geo. Ewald	1 00

Blue.

1st Prem.,	Thomas B. McCauley	$2 00
2nd Prem.,	Geo. McCauley	1 00

Any other color.

1st Prem.,	Thomas B. McCauley	$2 00
2nd Prem.,	Geo. Ewald	1 00

English Trumpeters.

White.

1st Prem.,	Walter O. Bahr, Manitowoc, Wis.	$2 00
2nd Prem.,	Walter O. Bahr	1 00

Black.

1st Prem.,	Herman Vanselow	$2 00
2nd Prem.,	Walter O. Bahr	1 00

Blue.

1st Prem.,	Walter O. Bahr	$2 00
2nd Prem.,	Walter O. Bahr	1 00

Mottled.

1st Prem.,	W. F. & L. S. Rippert, Burlington, Ia.	$2 00
2nd Prem.,	Walter O. Bahr	1 00

Any other color.

1st Prem.,	Herman Vanselow	$2 00
2nd Prem.,	Herman Vanselow	1 00

Brunswick or Baldhead Trumpeters.

Red.

1st Prem., W. F. & L. S. Rippert	$2 00
2nd Prem., W. F. & L. S. Rippert	1 00

Yellow.

1st Prem., W. F. & L. S. Rippert	$2 00

Blue.

1st Prem., W. F. & L. S. Rippert	1 00
2nd Prem., W. F. & L. S. Rippert	1 00

Altenburger Trumpeters.

Silver.

1st Prem., William G. Lueps & Son, Manitowoc, Wis	$2 00
2nd Prem., William G. Lueps & Son	1 00

Yellow.

1st Prem., William G. Lueps & Son	$2 00
2nd Prem., William G. Lueps & Son	1 00

Black.

1st Prem., A. M. Fiebrantz, Milwaukee, Wis	$2 00

Short Faced Tumblers.

Almond.

1st Prem., Mrs. R. B. Dobrogowski, Whitefish Bay, Wis	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

Red.

1st Prem., Mrs. R. B. Dobrogowski	$2 00
2nd Prem., T. Williamson, Milwaukee, Wis	1 00

Mottled.

1st Prem., Mrs. R. D. Dobrogowski	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

Kite.

1st Prem., Mrs. R. B. Dobrogowski	$2 00
2nd Prem., Mrs. R. B. Dobrowgowski	1 00

Any other variety.

1st Prem., Mrs. R. B. Dobrowgowski	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

Long-faced Tumblers (Clean-legged.)

Red.

1st Prem., R. B. Dobrogowski, Whitefish Bay, Wis	$2 00
2nd Prem., Geo. Ewald	1 00

Black.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., T. Williamsen	1 00

White.

1st Prem., T. Williamsen	$2 00
2nd Prem., Albert Magnus, Jr., Chicago, Ill	1 00

Yellow.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., Geo. Ewald	1 00

Red mottled.

1st Prem., T. Williamsen	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., T. Williamsen	1 00

Long-faced Tumblers (Muffled).

1st Prem., C. Williamsen, Milwaukee, Wis	$2 00
2nd Prem., R. B. Dobrogowski	1 00

Red.

1st Prem., C. Williamsen	$2 00
2nd Prem., Geo. Ewald	1 00

Yellow.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Black.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Blue.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., Geo. Ewald	1 00

White.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Red mottled or Rose Wing.

1st Prem., C. Williamsen	$2 00
2nd Prem., C. Williamsen	1 00

Yellow Mottled or Rose Wing.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Black mottled or Rose Wing.

1st Prem., C. Williamsen	$2 00
2nd Prem., C. Williamsen	1 00

Bald-head Tumblers.

Black.

1st Prem., F. H. Williamsen, Milwaukee, Wis	$2 00
2nd Prem., R. B. Dobrogowski	1 00

Red.

1st Prem., Geo. Ewald	$2 00
2nd Prem., R. B. Dobrogowski	1 00

Yellow.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., F. H. Williamsen	1 00

Parlor Tumblers.

Red.

1st Prem., Jos. K. Barta, Jr., Milwaukee, Wis	$2 00
2nd Prem., Jos. K. Barta, Jr	1 00

Yellow.

1st Prem., Jos. K. Barta, Jr	$2 00
2nd Prem., Jos. K. Barta, Jr	1 00

Black.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Jos. K. Barta, Jr	1 00

Any other color.

1st Prem., Jos. K. Barta, Jr	$2 00
2nd Prem., Jos. K. Barta, Jr	1 00

Moore-head Tumblers.

Black.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., M. Pasbrig, Wauwatosa, Wis	1 00

Any other color.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., F. H. Williamsen	1 00

Saddles.

Blue.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Black.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., C. Williamsen	1 00

Red.

1st Prem., C. Williamsen	$2 00
2nd Prem., R. B. Dobrogowski	1 00

Any other color.

1st Prem., C. Williamsen	$2 00

Badges.

Black.

1st Prem., H. Williamsen, Milwaukee, Wis	$2 00
2nd Prem., H. Williamsen	1 00

Any other color.

1st Prem., H. Williamsen	$2 00
2nd Prem., H. Williamsen	1 00

Tipplers.

Dark mottled.

1st Prem., John Kazolka	$2 00
2nd Prem., William H. Augstein, Milwaukee, Wis	1 00

Light mottled.

1st Prem., John C. Hug, Milwaukee, Wis	$2 00
2nd Prem., William C. Augstein	1 00

English Beards.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

Yellow.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Mrs. R. B. Dobrogowski	1 00

German Beards.

Blue.

1st Prem., Geo. Ewald	$2 00

Barless Swallows.

Red.

1st Prem., Theo Reuter, Milwaukee, Wis	$2 00
2nd Prem., Alvin Frantz, Milwaukee, Wis	1 00

Yellow.

1st Prem., Theo Reuter	$2 00
2nd Prem., Theo Reuter	1 00

Black.

1st Prem., Theo Reuter	$2 00
2nd Prem., Theo Reuter	1 00

Blue.

1st Prem., Alvin Frantz	$2 00
2nd Prem., Alvin Frantz	1 00

Fairy Swallows.

Blue spangled.

1st Prem., Jacob Horn, Milwaukee, Wis	$2 00

Black spangled.

1st Prem., Jacob Horn	$2 00
2nd Prem., Jacob Horn	1 00

Swallows with White Bars.

Blue.

1st Prem., Theo Reuter	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00

Frillbacks.

White.

1st Prem., William Korb	$2 00
2nd Prem., Walter O. Bahr	1 00

English Owls.

Black.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Blue.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Silver.

1st Prem., Herman Kretschmer	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Chinese Owls.

Blue.

1st Prem., Geo. Ewald	$2 00
2nd Prem., H. Williamsen	1 00

Silver.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

African Owls.

Black.

1st Prem., Thomas B. McCauley	$2 00
2nd Prem., Thomas B. McCauley	1 00

Silver.

1st Prem., Geo. Ewald	$2 00

White.

1st Prem., Thomas B. McCauley	$2 00
2nd Prem., Thomas B. McCauley	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Thomas B. McCauley	1 00

Tail Colored Owls.

Black tails.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Dragons.

Blue.

1st Prem., F. L. Schmitt & Son, Milwaukee, Wis	2 00
2nd Prem., F. L. Schmitt & Son	1 00

Yellow.

1st Prem., H. C. Schmitt	$2 00
2nd Prem., H. C. Schmitt	1 00

Black.

1st Prem., F. L. Schmitt & Son	$2 00
2nd Prem., F. L. Schmitt & Son	1 00

White.

2nd Prem., F. L. Schmitt & Son	1 00
1st Prem., F. L. Schmitt & Son	$2 00

Red.

1st Prem., H. C. Schmitt	$2 00
2nd Prem., Hoyt Co	1 00

Any other color.

1st Prem., F. L. Schmitt & Son	$2 00
2nd Prem., F. L. Schmitt	1 00

Helmets.

Red.

1st Prem., Geo. Ewald	$2 00

Yellow.

1st Prem., Geo. Ewald	$2 00

Any other color.

1st Prem., G. R. Schubert	$2 00
2nd Prem., Walter O. Bahr	1 00

Nuns.

Red.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Geo. Ewald	1 00

Yellow.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Black.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Any other color.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Priests.

Black.

1st Prem., Dr. J. F. Roe	$2 00
2nd Prem., Theo Reuter	1 00

Blue.

1st Prem., Theo Reuter	$2 00
2nd Prem., Dr. J. F. Roe	1 00

Any other color.

1st Prem., Dr. J. F. Roe	$2 00
2nd Prem., Dr. J. F. Roe	1 00

Quakers.

Red.

1st Prem., M. Pasbrig	$2 00
2nd Prem., M. Pasbrig	1 00

Black.

1st Prem., Theo Reuter	$2 00

Any other color.

1st Prem., M. Pasbrig	$2 00
2nd Prem., M. Pasbrig	1 00

Show Homers.

Blue checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Black checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Red checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Any other color.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Flying Homers.

Blue.

1st Prem., Ferd Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Silver or mealy.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Geo. Ewald	1 00

White.

1st Prem., Ferd Vanselow	$2 00
2nd Prem., Peter Elmer, Jr., Milwaukee, Wis	1 00

Blue checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Ferd Vanselow	1 00

Red checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Ferd Vanselow	1 00

Black checker.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Aug. C. Neess, Milwaukee, Wis	1 00

Any other color.

1st Prem., Raleigh Falbe, Milwaukee, Wis	$2 00

Scandaroons.

Black.

1st Prem., Walter Korb, Milwaukee, Wis	$2 00
2nd Prem., Walter Korb	1 00

Blue.

1st Prem., Walter Korb	$2 00
2nd Prem., Walter Korb	1 00

Red.

1st Prem., Walter Korb	$2 00
2nd Prem., Walter Korb	1 00

Yellow.

1st Prem., William Korb	$2 00

Mixed Class.

Strassers.

1st Prem., Walter Korb	$2 00
2nd Prem., Walter Korb	1 00

Blue-black barred swallows.

1st Prem., Theo Reuter	$2 00
2nd Prem., Alvin Frantz	1 00

Starlings.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Tail turbits.

1st Prem., Geo. Ewald	$2 00

Archangels.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Ice pigeons.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Herman Vanselow	1 00

Shields.

1st Prem., Walter Korb	$2 00
2nd Prem., Walter Korb	1 00

Tiger swallows, any color.

1st Prem., G. R. Schubert	$2 00
2nd Prem., Jacob Horn	1 00

Any single breed not mentioned.

1st Prem., G. R. Schubert	$2 00
2nd Prem., Jacob Horn	1 00

Young Birds in Pairs.

Frillbacks.

1st Prem., William Korb	$2 00
2nd Prem., William Korb	1 00

Show homers.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Flying homers.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Geo. Ewald	1 00

Magpies.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Mrs. E. Reuter	1 00

White fantails.

1st Prem., Geo. Ewald	$2 00

Colored fantails.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Carriers.

1st Prem., Herman Kretschmer	$2 00
2nd Prem., Geo. Ewald	1 00

Swallows.

1st Prem., Mrs. E. Reuter	$2 00
2nd Prem., Mrs. E. Reuter	1 00

Muffled tumblers.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., F. H. Williamsen	1 00

Clean-legged tumblers.

1st Prem., R. B. Dobrogowski	$2 00
2nd Prem., Walter G. Rugowski, Manitowoc, Wis.	1 00

Short-faced tumblers.

1st Prem., T. Williamsen	$2 00
2nd Prem., R. B. Dobrogowski	1 00

Priests.

1st Prem., Dr. J. F. Roe	$2 00
2nd Prem., Dr. J. F. Roe	1 00

1st Prem., Herman Vanselow	$2 00
2nd Prem., Geo. Ewald	1 00

Quakers.

1st Prem., M. Pasbrig	$2 00
2nd Prem., M. Pasbrig	1 00

Owls.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

White barred swallows.

1st Prem., Mrs. E. Reuter	$2 00
2nd Prem., Mrs. E. Reuter	1 00

Fairy swallows.

1st Prem., Jacob Horn	$2 00

Turbits.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

English trumpeters.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Walter W. Rugowski	1 00

Altenburger trumpeters.

1st Prem., A. M. Fiebrantz	$2 00
2nd Prem., A. M. Fiebrantz	1 00

Jacobins.

1st Prem., Geo. Ewald	$2 00
2nd Prem., Geo. Ewald	1 00

Dragons.

1st Prem., H. C. Schmitt	$2 00
2nd Prem., H. C. Schmitt	1 00

Oriental frills.

1st Prem., Herman Vanselow	$2 00
2nd Prem., Dr. J. F. Roe	1 00

Coops.

1st Prem., Geo. Ewald	$10 00
2nd Prem., Dr. J. F. Roe	8 00
3rd Prem., Alvin Frantz	6 00
4th Prem., F. H. Williamsen	4 00
5th Prem., Mrs. R. B. Dobrogowski	3 00

AGRICULTURE.

Judges.

Prof. R. A. Moore, Madison, Wis.
Geo. C. Hill, Rosendale, Wis.

GRAINS

Winter wheat.

1st Prem., Gust Schreiber, Cleveland, Wis	$4 00
2nd Prem., John Hans, Jefferson, Wis	2 00
3rd Prem., A. Selle, Thiensville, Wis	1 00

Spring wheat.

1st Prem., H. P. West, Ripon, Wis	$4 00
2nd Prem., John Hans	2 00
3rd Prem., Gust Schreiber	1 00

Black oats.

1st Prem., F. H. Meekin & Son, Fond du Lac, Wis	$4 00
2nd Prem., A. Selle	2 00
3rd Prem., A. L. Kleeber, Reedsburg, Wis	1 00

Swedish select oats (Wis. No. 2).

1st Prem., H. E. Krueger, Beaver Dam, Wis	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., Gust Schreiber	1 00

Any other variety of oats.

1st Prem., A. Selle	$4 00
2nd Prem., W. F. Pilgrim, Waukesha, Wis	2 00
3rd Prem., Frank J. Lindley, Fox Lake, Wis	1 00

Manchuria barley (Wis. No. 62).

1st Prem., John Hans	$4 00
2nd Prem., H. E. Krueger	2 00
3rd Prem., H. P. West	1 00

Oderbrucker barley (Wis. No. 55).

1st Prem., John Hans	$4 00
2nd Prem., H. E. Krueger	2 00
3rd Prem., Gust Schreiber	1 00

Any other variety of barley.

1st Prem., H. E. Krueger	$4 00
2nd Prem., Gust Schreiber	2 00
3rd Prem., A. L. Kleeber	1 00

Spring rye.

1st Prem., John Hans	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., J. H. Pilgrim, Milwaukee, Wis	1 00

Winter rye.

1st Prem., John Hans	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., J. H. Pilgrim	1 00

Japanese buckwheat.

1st Prem., H. P. West	$4 00
2nd Prem., John Hans	2 00
3rd Prem., J. H. Pilgrim	1 00

Silver hull buckwheat.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., A. L. Kleeber	2 00
3rd Prem., John Hans	1 00

American or Russian flax.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., W. F. Pilgrim	2 00
3rd Prem., H. P. West	1 00

Timothy.

1st Prem., F. H. Meekin & Son	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., W. F. Pilgrim	1 00

Red clover, medium.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., F. H. Meekin & Son	2 00
3rd Prem., John Hans	1 00

Red clover, mammoth.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., A. L. Kleeber	1 00

White clover.

1st Prem., R. H. Pilgrim, Milwaukee, Wis	$4 00
2nd Prem., J. H. Pilgrim	2 00
3rd Prem., H. P. West	1 00

Alsike clover.

1st Prem., H. P. West	$4 00
2nd Prem., J. H. Pilgrim	2 00
3rd Prem., F. H. Meekin & Son	1 00

Red top clover.

1st Prem., John Hans	$4 00
2nd Prem., J. H. Pilgrim	2 00
3rd Prem., H. P. West	1 00

German millet.

1st Prem., W. F. Pilgrim	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., J. H. Pilgrim	1 00

Hungarian or other variety of millet.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., W. F. Pilgrim	1 00

Soy beans.

1st Prem., H. P. West	$4 00
2nd Prem., F. H. Meekin & Son	2 00

Extra early peas.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., Justin Grape, Waukesha, Wis	1 00

Green field peas.

1st Prem., Justin Grape	$4 00
2nd Prem., Gust Schreiber	2 00
3rd Prem., John Hans	1 00

White field peas.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., A. L. Kleeber	2 00
3rd Prem., H. P. West	1 00

Late wrinkled peas.

1st Prem., Gust Schreiber	$4 00
2nd Prem., Frank J. Lindley	2 00
3rd Prem., Justin Grape	1 00

Early wrinkled peas.

1st Prem., J. H. Pilgrim	$4 00
2nd Prem., Justin Grape	2 00
3rd Prem., H. P. West	1 00

Navy beans.

1st Prem., Addison Love, Waukesha, Wis	$4 00
2nd Prem., H. P. West	2 00
3rd Prem., Chas. W. Howitt, Randolph, Wis	1 00

Any other field beans.

1st Prem., Frank J. Lindley	$4 00
2nd Prem., Justin Grape	2 00
3rd Prem., Toole Bros., Baraboo, Wis	1 00

Wax beans.

1st Prem., Frank J. Lindley	$4 00
2nd Prem., Justin Grape	2 00
3rd Prem., Henry J. Schulte, Wauwatosa, Wis	1 00

Lima beans.

1st Prem., Justin Grape	$4 00

Corn.

Clark's yellow dent.

1st Prem., John Hans	$6 00
2nd Prem., Stiles & Zahr, Jefferson, Wis	4 00
3rd Prem., Mrs. John Hans, Jefferson, Wis	3 00
4th Prem., A. N. Kelly, Mineral Point, Wis	2 00

Silver king (Wis. No. 7).

1st Prem., A. C. Ellicksen, Arlington, Wis	$6 00
2nd Prem., Frank J. Lindley	4 00
3rd Prem., F. H. Meekin & Son	3 00
4th Prem., John Hans	2 00

Wisconsin No. 8.

1st Prem., John Hans	$6 00
2nd Prem., Mrs. John Hans	4 00
3rd Prem., A. N. Kelly	3 00
4th Prem., Chas. H. Howitt	2 00

Golden glow (Wis. No. 12).

1st Prem., John Hans	$6 00
2nd Prem., Chas. H. Howitt	4 00
3rd Prem., H. P. West	3 00
4th Prem., Frank J. Lindley	2 00

North star yellow dent.

1st Prem., Toole Bros	$6 00
2nd Prem., Stiles & Zahr	4 00
3rd Prem., H. P. West	3 00
4th Prem., John Hans	2 00

Yellow flint.

1st Prem., Frank J. Lindley	$6 00
2nd Prem., John Hans	4 00
3rd Prem., Henry J. Schulte	3 00
4th Prem., Mrs. John Hans	2 00

White flint.

1st Prem., Henry J. Schulte	$6 00
2nd Prem., E. L. Benedict, Beloit, Wis	4 00
3rd Prem., Robert Pilgrim, Milwaukee, Wis	3 00
4th Prem., H. P. West	2 00

Sweet, early.

1st Prem., Chas. H. Howitt	$4 00
2nd Prem., Justin Grape	3 00
3rd Prem., Robert Pilgrim	2 00

Sweet, late.

1st Prem., Frank J. Lindley	$4 00
2nd Prem., Addison Love	3 00
3rd Prem., Vernon Kinney, Wauwatosa, Wis	2 00

Pop corn.

1st Prem., Henry J. Schulte	$4 00
2nd Prem., J. H. Pilgrim	3 00
3rd Prem., Addison Love	1 00

Any other variety.

1st Prem., Geo. Martin, Darlington, Wis	$4 00
2nd Prem., John Hans	3 00
3rd Prem., Frank J. Lindley	1 00

Best 15 ears any variety.

1st Prem., A. C. Ellicksen	$10 00

Vegetables.

Turnip blood beets.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Frank J. Lindley	1 00

Long blood beets.

1st Prem., Lizzie Mayer, Wauwatosa, Wis	$2 00
2nd Prem., E. L. Benedict	1 50
3rd Prem., Henry J. Schulte	1 00

Long red mangolds.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., E. L. Benedict	1 50
3rd Prem., Justin Grape	1 00

Yellow tankards.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Frank J. Lindley	1 00

Yellow onions.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Justin Grape	1 00

Red onions.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Frank J. Lindley	1 00

White onions.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Justin Grape	1 00

Drumhead cabbages.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., Justin Grape	1 00

Hollander cabbages.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Frank J. Lindley	1 00

Pointed cabbages.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., William McMorran, Fox Lake, Wis	1 00

Yellow carrots.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Frank J. Lindley	1 50
3rd Prem., E. L. Benedict	1 00

White carrots.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Frank J. Lindley	1 50
3rd Prem., Justin Grape	1 00

Oxhart cabbages.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., E. L. Benedict	1 50
3rd Prem., Justin Grape	1 00

Cauliflower.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Lizzie Mayer	1 50
3rd Prem., Justin Grape	1 00

Celery.

1st Prem., Justin Grape	$2 00

Parsnips.

1st Prem., Justin Grape	$2 00
2nd Prem., Frank J. Lindley	1 50
3rd Prem., E. W. Ripley, Salem, Wis	1 00

Watermelons.

1st Prem., Justin Grape	$2 00
2nd Prem., Geo. Schluemer, West Allis, Wis	1 50
3rd Prem., Frank J. Lindley	1 00

Muskmelons.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Frank J. Lindley	1 50
3rd Prem., Justin Grape	1 00

Hubbard squashes.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Herman Ziemer, West Allis, Wis	1 00

Largest Squash.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., Justin Grape	1 00

Largest Pumpkin.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Frank J. Lindley	1 00

Tomatoes.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Lizzie Mayer	1 50
3rd Prem., E. L. Benedict	1 00

Flat Turnips.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Robert Pilgrim	1 00

Rutabagas.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Lizzie Mayer	1 00

Yellow Pumpkins.

1st Prem., Justin Grape	2 00
2nd Prem., Lizzie Mayer	1 50
3rd Prem., Vernon Kinney	1 00

Egg Plants.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., Justin Grape	1 00

Cucumbers.

1st Prem., Justin Grape	2 00
2nd Prem., E. L. Benedict	1 50
3rd Prem., Vernon Kinney	1 00

Peppers.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Justin Grape	1 50
3rd Prem., Lizzie Mayer	1 00

Potatoes.

Ohio Family.

1st Prem., William McMorran	$4 00
2nd Prem., A. N. Kelly	2 00
3rd Prem., H. P. West	1 00

Rose Family.

1st Prem., William McMorran	$4 00
2nd Prem., A. N. Kelly	2 00

Hebron Family.

1st Prem., William McMorran	$4 00
2nd Prem., A. N. Kelly	2 00
3rd Prem., H. P. West	1 00

Rural Family.

1st Prem., William McMorran	$4 00

Potatoes—Farmers' Class.

World's Fair.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Robert Pilgrim	1 50
3rd Prem., E. L. Benedict	1 00

Early Ohio.

1st Prem., Frank J. Lindley	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., E. L. Benedict	1 00

Rural New Yorker No. 2.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., Robert Pilgrim	1 50
3rd Prem., E. L. Benedict	1 00

Early Rose.

1st Prem., Henry J. Schulte	$2 00
2nd Prem., E. L. Benedict	1 50
3rd Prem., Frank J. Lindley	1 00

Beauty of Hebron.

1st Prem., E. L. Benedict	$2 00
2nd Prem., Henry J. Schulte	1 50

Early Michigan.

1st Prem., Justin Grape	$2 00
2nd Prem., Henry J. Schulte	1 50
3rd Prem., Robert Pilgrim	1 00

Burbank.

1st Prem.,	Frank J. Lindley	$2 00
2nd Prem.,	E. L. Benedict	1 50
3rd Prem.,	Henry J. Schulte	1 00

Carmen No 3.

1st Prem.,	Herman Ziemer	$2 00
2nd Prem.,	Justin Grape	1 50
3rd Prem.,	Henry J. Schulte	1 00

Sir Walter Raleigh.

1st Prem.,	Henry J. Schulte	$2 00
2nd Prem.,	E. L. Benedict	1 50
3rd Prem.,	Addison Love	1 00

California Russet.

1st Prem.,	Justin Grape	$2 00
2nd Prem.,	E. L. Benedict	1 50
3rd Prem.,	Henry J. Schulte	1 00

White Victor.

1st Prem.,	Henry J. Schulte	$2 00
2nd Prem.,	E. L. Benedict	1 50
3rd Prem.,	Frank J. Lindley	1 00

Voeneham.

1st Prem.,	Henry J. Schulte	$2 00
2nd Prem.,	Frank J. Lindley	1 50
3rd Prem.,	E. L. Benedict	1 00

Any other variety.

1st Prem.,	Henry J. Schulte	$2 00
2nd Prem.,	Frank J. Lindley	1 50
3rd Prem.,	Frank J. Lindley	1 00

Miscellaneous.

Show of leaf tobacco.

1st Prem.,	Henry J. Schulte	$10 00
2nd Prem.,	F. J. Lindley	5 00
3rd Prem.,	Justin Grape	3 00

Show of sugar beets.

1st Prem., Stiles & Zahr	$10 00
2nd Prem., Gust Schreiber	5 00
3rd Prem., E. L. Benedict	3 00

Boys' Class.

Corn.

Yellow dent corn.

1st Prem., Ben Hans, Jefferson, Wis	$6 00
2nd Prem., H. Vaughn, West Ripon, Wis	4 00
3rd Prem., Joe Pilgrim, Milwaukee, Wis	2 00
4th Prem., Frank Benedict, Beloit, Wis	1 00

White dent corn.

1st Prem., Ben Hans	$6 00
2nd Prem., Harold A. Lewis, Fond du Lac, Wis	4 00
3rd Prem., H. Vaughn West	2 00
4th Prem., Frank Benedict	1 00

Yellow flint corn.

1st Prem., Harry Twinem, Wauwatosa, Wis	$6 00
2nd Prem., Addison Love, Waukesha, Wis	4 00
3rd Prem., Ben Hans	2 00
4th Prem., Ralph C. Pilgrim, Waukesha, Wis	1 00

White flint corn.

1st Prem., Frank Benedict	$6 00
2nd Prem., Jos. Pilgrim	4 00
3rd Prem., Ben Hans	2 00
4th Prem., Harold A. Lewis	1 00

Pop corn.

1st Prem., Joe Pilgrim	$6 00
2nd Prem., Addison Love	4 00
3rd Prem., Harry Twinem	2 00
4th Prem., Harold A. Lewis	1 00

Vegetables.

Turnip blood beets.

1st Prem., Frank Benedict	$2 00
2nd Prem., Ralph A. Pilgrim	1 00

Long blood beets.

1st Prem., Francis Tennis, Wauwatosa, Wis	$2 00
2nd Prem., Frank Benedict	1 00

Long red mangolds.

1st Prem., Joe Pilgrim	$2 00
2nd Prem., Frank Benedict	1 00

Yellow tankards.

1st Prem., Francis Tennis	$2 00
2nd Prem., Joe Pilgrim	1 00

Yellow onions.

1st Prem., Addison Love	$2 00
2nd Prem., Harry Twinem	1 00

Red onions.

1st Prem., Francis Twinem	$2 00
2nd Prem., H. Vaughn West	1 00

White onions.

1st Prem., Francis Tennis	$2 00
2nd Prem., Frank Benedict	1 00

Drumhead cabbages.

1st Prem., Frank Benedict	$2 00
2nd Prem., Jos. Pilgrim	1 00

Pointed cabbages.

1st Prem., Harry Twinem	$2 00
2nd Prem., Frank Benedict	1 00

Hollander cabbages.

1st Prem., Harry Twinem	$2 00
2nd Prem., Frank Benedict	1 00

Long yellow carrots.

1st Prem., Ben Hans	$2 00
2nd Prem., Frank Benedict	1 00

Long white carrots.

1st Prem., Frank Benedict	$2 00
2nd Prem., Addison Love	1 00

Oxhart carrots.

1st Prem., Francis Tennis	$2 00
2nd Prem., Ben Hans	1 00

Cauliflower.

1st Prem., Harry Twinem	$2 00
2nd Prem., Francis Tennis	1 00

Celery.

1st Prem., Addison Love	$2 00
2nd Prem., Frank Benedict	1 00

Parsnips.

1st Prem., Frank Benedict	$2 00
2nd Prem., Addison Love	1 00

Watermelons.

1st Prem., Addison Love	$2 00
2nd Prem., Francis Tennis	1 00

Muskmelons.

1st Prem., Francis Tennis	$2 00
2nd Prem., Joe Pilgrim	1 00

Hubbard squashes.

1st Prem., Harold A. Lewis	$2 00
2nd Prem., Francis Tennis	1 00

Largest squash.

1st Prem., Harry Twinem	$2 00
2nd Prem., Frank Benedict	1 00

Largest pumpkin.

1st Prem., Harry Twinem	$2 00
2nd Prem., Frank Benedict	1 00

Tomatoes.

1st Prem., Harry Twinem	$2 00
2nd Prem., Harold A. Lewis	1 00

Flat turnips.

1st Prem., Joe Pilgrim	$2 00
2nd Prem., Francis Tennis	1 00

Rutabagas.

1st Prem., Frank Benedict	$2 00
2nd Prem., Ralph A. Pilgrim	1 00

Yellow Pumpkins.

1st Prem., Francis Tennis	$2 00
2nd Prem., Ralph A. Pilgrim	1 00

Egg Plants.

1st Prem., Francis Tennis	$2 00
2nd Prem., Addison Love	1 00

Cucumbers.

1st Prem., Harold A. Lewis	$2 00
2nd Prem., Addison Love	1 00

Peppers.

1st Prem., Harry Twinem	$2 00
2nd Prem., Addison Love	1 00

Potatoes.

World's Fair.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Early Ohio.

1st Prem., Addison Love	$2 00
2nd Prem., Frank Benedict	1 00

Early New Yorker No. 2.

1st Prem., Joe Pilgrim	$2 00
2nd Prem., Frank Benedict	1 00

Early Rose.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Beauty of Hebron.

1st Prem., Ralph A. Pilgrim	$2 00
2nd Prem., Joe Pilgrim	1 00

California Russet.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Early Michigan.

1st Prem., Frank Benedict	$2 00
2nd Prem., Ralph A. Pilgrim	1 00

Burbank.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

White Victor.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Voeneham.

1st Prem., Frank Benedict	$2 00
2nd Prem., Jos. Pilgrim	1 00

Carmen No. 3.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Sir Walter Raleigh.

1st Prem., Joe Pilgrim	$2 00
2nd Prem., Frank Benedict	1 00

Any other variety.

1st Prem., Frank Benedict	$2 00
2nd Prem., Joe Pilgrim	1 00

Burpee Premium.

Best collection of vegetables grown from Burpee's seeds.

Prem., Justin Grape	$20 00

FARM EXHIBITS.

Judge.

L. L. Olds, Madison, Wis.

1st Prem., H. P. West, Ripon Wis	$100 00
2nd Prem., Frank J. Lindley, Fox Lake, Wis	90 00
3rd Prem., Chas. H. Howitt, Randolph, Wis	80 00
4th Prem., E. L. Benedict, Beloit, Wis	70 00
5th Prem., Gust Schreiber, Cleveland, Wis	60 00
6th Prem., John Grape, Waukesha, Wis	50 00
7th Prem., E. W. Ripley, Salem, Wis	40 00
8th Prem., W. F. Pilgrim, Waukesha, Wis	30 00
9th Prem., A. N. Kelly, Mineral Point, Wis	20 00

BEES AND HONEY.

Judge.

Frank Wilcox, Mauston, Wis.

Display comb honey.

1st Prem., W. E. Prisk, Mineral Point, Wis	$12 00
2nd Prem., E. D. Ochsner, Prairie du Sac, Wis	10 00
3rd Prem., A. L. Kleeber, Reedsburg, Wis	7 00
4th Prem., W. H. Putnam, River Falls, Wis	4 00

Case white comb honey.

1st Prem., Mrs. Abbie Prisk, Mineral Point, Wis	$8 00
2nd Prem., W. E. Prisk	6 00
3rd Prem., W. H. Putnam	4 00
4th Prem., E. D. Ochsner	2 00

Case amber comb honey.

1st Prem., W. E. Prisk	$8 00
2nd Prem., W. H. Putnam	6 00
3rd Prem., J. J. Ochsner, Prairie du Sac, Wis	4 00
4th Prem., Samuel Weller, Milwaukee, Wis	2 00

Display of honey in extracting frames.

1st Prem., W. H. Putnam	$5 00
2nd Prem., W. E. Prisk	3 50
3rd Prem., E. D. Ochsner	2 50
4th Prem., A. L. Kleeber	1 50

Display extracted honey.

1st Prem., W. E. Prisk	$12 00
2nd Prem., E. D. Ochsner	10 00
3rd Prem., A. L. Kleeber	7 00
4th Prem., Samuel Weller	4 00

Case extracted white clover honey.

1st Prem., E. R. Thomas & Son, Nashotah, Wis	$8 00
2nd Prem., Henry Tesarik, Manitowoc, Wis	6 00
3rd Prem., W. E. Prisk	4 00
4th Prem., A. L. Kleeber	2 00

Case extracted basswood honey.

1st Prem., J. J. Ochsner	$8 00
2nd Prem., A. L. Kleeber	6 00
3rd Prem., W. H. Putnam	4 00
4th Prem., W. E. Prisk	2 00

Case other extracted white honey.

1st Prem., W. H. Putnam	$8 00
2nd Prem., W. E. Prisk	6 00
3rd Prem., J. J. Ochsner	4 00
4th Prem., E. D. Ochsner	2 00

Case extracted amber honey.

1st Prem., A. L. Kleeber	$8 00
2nd Prem., W. E. Prisk	6 00
3rd Prem., W. H. Putnam	4 00
4th Prem., E. D. Ochsner	2 00

Display granulated honey.

1st Prem., A. L. Kleeber	$8 00
2nd Prem., W. E. Prisk	6 00
3rd Prem., W. H. Putnam	4 00
4th Prem., E. D. Ochsner	2 00

Beeswax.

1st Prem., E. D. Ochsner	$6 00
2nd Prem., W. E. Prisk	4 00
3rd Prem., A. L. Kleeber	3 00
4th Prem., Samuel Weiler	2 00

Honey vinegar.

1st Prem., E. D. Ochsner	$4 00
2nd Prem., J. J. Ochsner	3 00
3rd Prem., W. H. Putnam	2 00

Nucleus golden yellow bees.

1st Prem., W. E. Prisk	$8 00
2nd Prem., Joseph M. Barr, West Allis, Wis	6 00
3rd Prem., Samuel Weiler	4 00
4th Prem., A. L. Kleeber	2 00

Nucleus dark Italian bees.

1st Prem., W. E. Prisk	$8 00
2nd Prem., A. L. Kleeber	6 00
3rd Prem., E. D. Ochsner	4 00
4th Prem., W. H. Putnam	2 00

Nucleus Carniolan bees.

1st Prem., J. J. Ochsner	$8 00
2nd Prem., W. E. Prisk	6 00
3rd Prem., E. D. Ochsner	4 00
4th Prem., A. L. Kleeber	2 00

Sweepstakes.

Largest and most attractive exhibit.

1st Prem., W. E. Prisk	$15 00
2nd Prem., E. D. Ochsner	12 00
3rd Prem., A. L. Kleeber	8 00
4th Prem., W. H. Putnam	6 00

Farmers' Exhibit.

Case white comb honey.

1st Prem., Joseph Volz, Wauwatosa, Wis	$3 00

Case amber comb honey.

1st Prem., Joseph Volz	$3 00

Case dark comb honey.

1st Prem., Joseph Volz	$3 00

Case white extracted honey.

1st Prem., Joseph Volz	$3 00

Case amber extracted honey.

1st Prem., Joseph Volz	$3 00

Case dark extracted honey.

1st Prem., Joseph Volz	$3 00

Farmers' Sweepstakes.

Largest and best exhibit.

1st Prem., Joseph Volz	$8 00

Design in comb honey.

1st Prem., W. E. Prisk	$4 00

Design in beeswax.

1st Prem., W. H. Putnam	$4 00

Candies made with honey.

1st Prem., W. H. Putnam	$5 00
2nd Prem., Mrs. Robert Ramsey, Baraboo, Wis	3 00

Demonstration.

Competitive Live Bee Demonstration.

Premium, $50.00.

W. E. Prisk	$12 50
E. D. Ochsner	12 50
A. L. Kleeber	12 50
W. H. Putnam	12 50

Wisconsin Apples.

HORTICULTURE.

FRUITS.

Judge.

L. G. Kellogg, Ripon, Wis.

Apples—Open to All.

Display 20 varieties.

1st Prem., John Reis, Twin Bluffs, Wis	$12 00
2nd Prem., Henry Fox, Baraboo, Wis	8 00
3rd Prem., A. D. Barnes, Waupaca, Wis	6 00

Display 10 varieties.

1st Prem., Henry Fox	$8 00
2nd Prem., John Reis	6 00
3rd Prem., A. D. Barnes	4 00

Display 5 Winter varieties.

1st Prem., John Reis	$6 00
2nd Prem., A. D. Barnes	4 00
3rd Prem., Henry Fox	2 00

Display Seedlings.

1st Prem., John Reis	$6 00
2nd Prem., A. D. Barnes	4 00

Largest Apple.

1st Prem., John Reis	$2 00
2nd Prem., A. D. Barnes	1 00

Single Plate.

Astrachan.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75

Anisim.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75
3rd Prem., Henry Fox	50

Antonovka.

1st Prem., Henry Fox	$1 00

Autumn strawberry.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75

Alexander.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75

Ben Davis.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75
3rd Prem., A. D. Barnes	50

Dudley.

1st Prem., A. D. Barnes	$1 00

Fameuse.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75
3rd Prem., A. D. Barnes	50

Fall Orange.

1st Prem., A. D. Barnes	$1 00
2nd Prem., Henry Fox	75

Golden Russet.

1st Prem., Henry Fox	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., John Reis	50

Gideon.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75
3rd Prem., A. D. Barnes	50

Haas.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75

Hibernal.

1st Prem., A. D. Barnes	$1 00
2nd Prem., Henry Fox	75
3rd Prem., John Reis	50

Lily.

1st Prem., John Reis	$1 00

Longfield.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., Toole Bros., Baraboo, Wis	50

Lubsk Queen.

1st Prem., John Reis	$1 00

Lowland Raspberry.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75
3rd Prem., Henry Fox	50

Malinda.

1st Prem., A. D. Barnes	$1 00

Mann.

1st Prem., A. D. Barnes	$1 00

McIntosh.

1st Prem., John Reis	$1 00

McMahan.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., Henry Fox	50

Newell.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., Henry Fox	50

Northwestern greening.

1st Prem., Henry Fox	$1 00
2nd Prem., John Fox	75
3rd Prem., A. D. Barnes	50

Okabena.

1st Prem., A. D. Barnes	$1 00

Oldenburg (Duchess).

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75
3rd Prem., John Grape, Waukesha, Wis	50

Patten greening.

1st Prem., Henry Fox	$1 00
2nd Prem., A. D. Barnes	75

Pewaukee.

1st Prem., Henry Fox	$1 00
2nd Prem., A. D. Barnes	75

Plumb cider.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75
3rd Prem., A. D. Barnes	50

Seek-no-farther.

1st Prem., A. D. Barnes	$1 00
2nd Prem., Toole Bros	75

Scott's winter.

1st Prem., Toole Bros	$1 00
2nd Prem., John Reis	75
3rd Prem., A. D. Barnes	50

Switzer.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75

Talman sweet.

1st Prem., John Reis	$1 00
2nd Prem., Toole Bros	75

Tetofsky.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75

Twenty ounce.

1st Prem., John Reis	$1 00

Utter red.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75

Walbridge.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	75
3rd Prem., A. D. Barnes	50

Wealthy.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75
3rd Prem., Toole Bros	50

Wisconsin spy.

1st Prem., A. D. Barnes	$1 00

Windsor.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., Henry Fox	50

Wolf River.

1st Prem., A. D. Barnes	$1 00
2nd Prem., Henry Fox	75
3rd Prem., John Reis	50

Crab Apples.

Sweet russet.

1st Prem., A. D. Barnes	$1 00
2nd Prem., John Reis	75

Hyslop.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75
3rd Prem., Henry Fox	50

Martha.

1st Prem., John Reis	$1 00

Transcendent.

1st Prem., John Reis	$1 00
2nd Prem., A. D. Barnes	75

Virginia.

1st Prem., A. D. Barnes	$1 00

General Grant.

1st Prem., A. D. Barnes	$1 00

Whitney.

1st Prem., Henry Fox	$1 00
2nd Prem., John Reis	75
3rd Prem., A. D. Barnes	50

Peck of Apples.

Wealthy.

1st Prem., A. D. Barnes	$4 00
2nd Prem., John Reis	3 00
3rd Prem., Henry Fox	2 00

Duchess.

1st Prem., John Reis	$4 00
2nd Prem., A. D. Barnes	3 00
3rd Prem., Henry Fox	2 00
4th Prem., John Grape	1 00

McMahan.

1st Prem., John Reis	$4 00
2nd Prem., A. D. Barnes	3 00
3rd Prem., Henry Fox	2 00

Lubsk Queen.

1st Prem., John Reis	$4 00

Yellow Transparent.

1st Prem., John Reis	$4 00
2nd Prem., Henry Fox	3 00

Apples—For Amateurs.

Display 20 varieties.

1st Prem., Mrs. Robert Ramsey, Baraboo, Wis	$12 00
2nd Prem., J. S. Palmer, Baraboo, Wis	8 00
3rd Prem., A. N. Kelly, Mineral Point, Wis	6 00
4th Prem., Geo. J. Jeffery, Milwaukee, Wis	4 00

Display 10 varieties.

1st Prem., Mrs. Robert Ramsey	$8 00
2nd Prem., J. S. Palmer	6 00
3rd Prem., A. N. Kelly	4 00
4th Prem., A. L. Benedict, Beloit, Wis	2 00

Display 5 winter varieties.

1st Prem., J. S. Palmer	$6 00
2nd Prem., Mrs. Robert Ramsey	4 00
3rd Prem., Geo. Jeffery	2 00

Display seedlings.

1st Prem., Geo. J. Jeffery	$6 00
2nd Prem., J. S. Palmer	4 00
3rd Prem., A. N. Kelly	2 00

Largest apple.

1st Prem., Mrs. Robert Ramsey	$2 00
2nd Prem., J. S. Palmer	1 00
3rd Prem., A. N. Kelly	50

Single Plate.

Astrachan.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. Jeffery	75

Anisim.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. Jeffery	75

Antonovka.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. Jeffery	75

Autumn strawberry.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Geo. Jeffery	75

Alexander.

1st Prem., A. A. White, Brookfield, Wis	$1 00

American codling.

1st Prem., Geo. J. Jeffery	$1 00

Beautiful arcade.

1st Prem., Mrs. Robert Ramsey	$1 00

Ben Davis.

1st Prem., A. N. Kelly	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., E. L. Benedict	50

Fameuse.

1st Prem., J. S. Palmer	$1 00
2nd Prem., A. N. Kelly	75
3rd Prem., Mrs. Robert Ramsey	50

Fall orange.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Geo. J. Jeffery	50

Gano.

1st Prem., A. N. Kelly	$1 00

Golden russet.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

Gideon.

1st Prem., A. N. Kelly	$1 00

Haas.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. A. White	50

Hibernal.

1st Prem., J. S. Palmer	$ 1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., Geo. J. Jeffery	50

Longfield.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., A. N. Kelly	75
3rd Prem., J. S. Palmer	50

Lowland raspberry.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. J. Jeffery	75

Malinda.

1st Prem., Mrs. Robert Ramsey	$1 00

Mann.

1st Prem., A. A. White	$1 00
2nd Prem., Geo. J. Jeffery	75
3rd Prem., A. N. Kelly	50

McMahan.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

McIntosh.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. A. White	50

Newell.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

Northwestern greening.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. J. Jeffery	75
3rd Prem., J. S. Palmer	50

Okabena.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. J. Jeffery	75

Oldenburg (Duchess).

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., A. N. Kelly	50

Patten Greening.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., A. N. Kelly	50

Pewaukee.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

Perry Russet.

1st Prem., Mrs. Robert Ramsey	$1 00

Plumb Cider.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Geo. J. Jeffery	50

Seek-no-farther.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Geo. J. Jeffery	75

Scott's Winter.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., E. L. Benedict	50

Switzer.

1st Prem., Geo. J. Jeffery	$1 00

Talman Sweet.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

Tetofsky.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75

Twenty Ounce.

1st Prem., Mrs. Robert Ramsey	$1 00

Utter red.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., Geo. J. Jeffery	50

Walbridge.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Geo. J. Jeffery	50

Wealthy.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. N. Kelly	50

Windsor.

1st Prem., Geo. J. Jeffery	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Mrs. Robert Ramsey	50

Wolf River.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	75
3rd Prem., A. A. White	50

Crab Apples.

Sweet Russet.

1st Prem., Mrs. Robert Ramsey	$1 00

Hyslop.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Geo. J. Jeffery	50

Martha.

1st Prem., Mrs. Robert Ramsey	$1 00

Transcendent.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	75
3rd Prem., Geo. J. Jeffery	50

Virginia.

1st Prem., Geo. J. Jeffery	$1 00

Whitney.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., A. A. White	75
3rd Prem., Geo. J. Jeffery	50

Peck of Apples.

Wealthy.

1st Prem., J. S. Palmer	$4 00
2nd Prem., Mrs. Robert Ramsey	3 00

1st Prem., Mrs. Robert Ramsey	$4 00
2nd Prem., J. S. Palmer	3 00
3rd Prem., A. A. White	2 00
4th Prem., A. N. Kelly	1 00

McMahan.

1st Prem., J. S. Palmer	$4 00
2nd Prem., Mrs. Robert Ramsey	3 00
3rd Prem., E. L. Benedict	2 00

Yellow Transparent.

1st Prem., J. S. Palmer	$4 00
2nd Prem., Mrs. Robert Ramsey	3 00

Sweepstakes.

Best and largest show of apples.

1st Prem., John Reis	$10 00
2nd Prem., A. D. Barnes	7 00
3rd Prem., Mrs. Robert Ramsey	5 00
4th Prem., J. S. Palmer	3 00
5th Prem., Henry Fox	2 00

Pears.

Collection.

1st Prem., W. J. Moyle, Union Grove, Wis	$6 00
2nd Prem., John Grape	4 00
3rd Prem., Geo. J. Jeffery	2 00

Single Plate.

Bartlett.

1st Prem., W. J. Moyle	$1 00
2nd Prem., John Grape	50

Clapp's Favorite.

1st Prem., John Grape	$1 00
2nd Prem., A. A. White	50

Clairglau.

1st Prem., W. J. Moyle	$1 00
2nd Prem., Geo. J. Jeffery	50

Flemish Beauty.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Kellogg & Schultz, Lake Mills, Wis	50

Howell.

1st Prem., W. J. Moyle	$1 00
2nd Prem., Geo. J. Jeffery	50

Kieffer.

1st Prem., J. S. Palmer	$1 00
2nd Prem., A. A. White	50

Lawrence.

1st Prem.,	John Grape	$1 00
2nd Prem.,	W. J. Moyle	50

Seckel.

1st Prem.,	Geo. J. Jeffery	$1 00
2nd Prem.,	W. J. Moyle	50

Sheldon.

1st Prem.,	W. J. Moyle	$1 00
2nd Prem.,	Geo. J. Jeffery	50

Vermont Beauty.

1st Prem.,	Geo. J. Jeffery	$1 00
2nd Prem.,	Kellogg & Schultz	50

Anjou.

1st Prem.,	W. H. Moyle	$1 00
2nd Prem.,	John Grape	50

Duchess.

1st Prem.,	John Grape	$1 00
2nd Prem.,	Geo. J. Jeffery	50

Lincoln.

1st Prem.,	Kellogg & Schultz	$1 00

Louise Bonne de Jersey.

1st Prem.,	W. J. Moyle	$1 00
2nd Prem.,	John Grape	50

Plums.

Collection of Native plums.

1st Prem.,	J. S. Palmer	$10 00
2nd Prem.,	Mrs. Robert Ramsey	6 00
3rd Prem.,	William Toole	4 00

Collection of European plums.

1st Prem.,	William Toole	$3 00
2nd Prem.,	Geo. J. Jeffery	2 00

Collection of Japanese plums.

1st Prem.,	Geo. J. Jeffery	$3 00
2nd Prem.,	Kellogg & Schultz	2 00

Single Plate.

De Soto.

1st Prem.,	William Toole	$1 00
2nd Prem.,	Kellogg & Schultz	75
3rd Prem.,	Mrs. Robert Ramsey	50

Forest garden.

1st Prem.,	J. S. Palmer	$1 00
2nd Prem.,	A. N. Kelly	75
3rd Prem.,	Mrs. Robert Ramsey	50

Hammer.

1st Prem.,	William Toole	$1 00
2nd Prem.,	J. S. Palmer	75
3rd Prem.,	Kellogg & Schultz	50

Hawkeye.

1st Prem.,	J. S. Palmer	$1 00
2nd Prem..	William Toole	75
3rd Prem.,	A. N. Kelly	50

Quaker.

1st Prem.,	William Toole	$1 00
2nd Prem.,	J. S. Palmer	75

Rockford.

1st Prem.,	Geo. J. Jeffery	$1 00

Surprise.

1st Prem.,	Kellogg & Schultz	$1 00

Wyant.

1st Prem.,	J. S. Palmer	$1 00
2nd Prem.,	Mrs. Robert Ramsey	75
3rd Prem.,	William Toole	50

Lombard.

1st Prem.,	Mrs. Robert Ramsey	$1 00
2nd Prem.,	A. N. Kelly	75
3rd Prem.,	Geo. J. Jeffery	50

Abundance.

1st Prem.,	Mrs. Robert Ramsey	$1 00
2nd Prem.,	Kellogg & Schultz	75

Grapes.

Display 15 varieties.

1st Prem.,	Henry Fox	$10 00
2nd Prem.,	John Reis	6 00
3rd Prem.,	Kellogg & Schultz	4 00

Display 10 varieties.

1st Prem.,	Henry Fox	$6 00
2nd Prem.,	Kellogg & Schultz	4 00
3rd Prem.,	John Reis	2 00

Display 5 varieties.

1st Prem.,	Henry Fox	$3 00
2nd Prem.,	Kellogg & Schultz	2 00
3rd Prem.,	John Reis	1 00

Canes.

Brighton.

1st Prem.,	Henry Fox	$2 00
2nd Prem.,	Kellogg & Schultz	1 00

Concord.

1st Prem.,	Henry Fox	$2 00
2nd Prem.,	John Reis	1 00

Delaware.

1st Prem.,	Henry Fox	$2 00
2nd Prem.,	John Reis	1 00

Moore's Diamond.

1st Prem., Henry Fox	$2 00
2nd Prem., John Reis	1 00

Worden.

1st Prem., John Reis	$2 00
2nd Prem., Henry Fox	1 00

Single Plate.

Agawan.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., Henry Fox	50

Brighton.

1st Prem., Henry Fox	$1 00
2nd Prem., Kellogg & Schultz	50

Concord.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., John Reis	50

Campbell Early.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., John Reis	50

Delaware.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	50

Green Mountain.

1st Prem., Henry Fox	$1 00
2nd Prem., Kellogg & Schultz	50

Lady.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., Henry Fox	50

Lady Washington.

1st Prem., Henry Fox	$1 00

Moore's Early.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., Henry Fox	50

Moore's Diamond.

1st Prem., Henry Fox	$1 00
2nd Perm., Kellogg & Schultz	50

McPike.

1st Prem., Kellogg & Schultz	$1 00
2nd Prem., John Reis	50

Niagara.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	50

Salem.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	50

Worden.

1st Prem., Henry Fox	$1 00
2nd Perm., Kellogg & Schultz	50

Wilder.

1st Prem., Henry Fox	$1 00
2nd Prem., John Reis	50

Lindley.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	50

Pocklington.

1st Prem., Henry Fox	$1 00
2nd Prem., John Reis	50

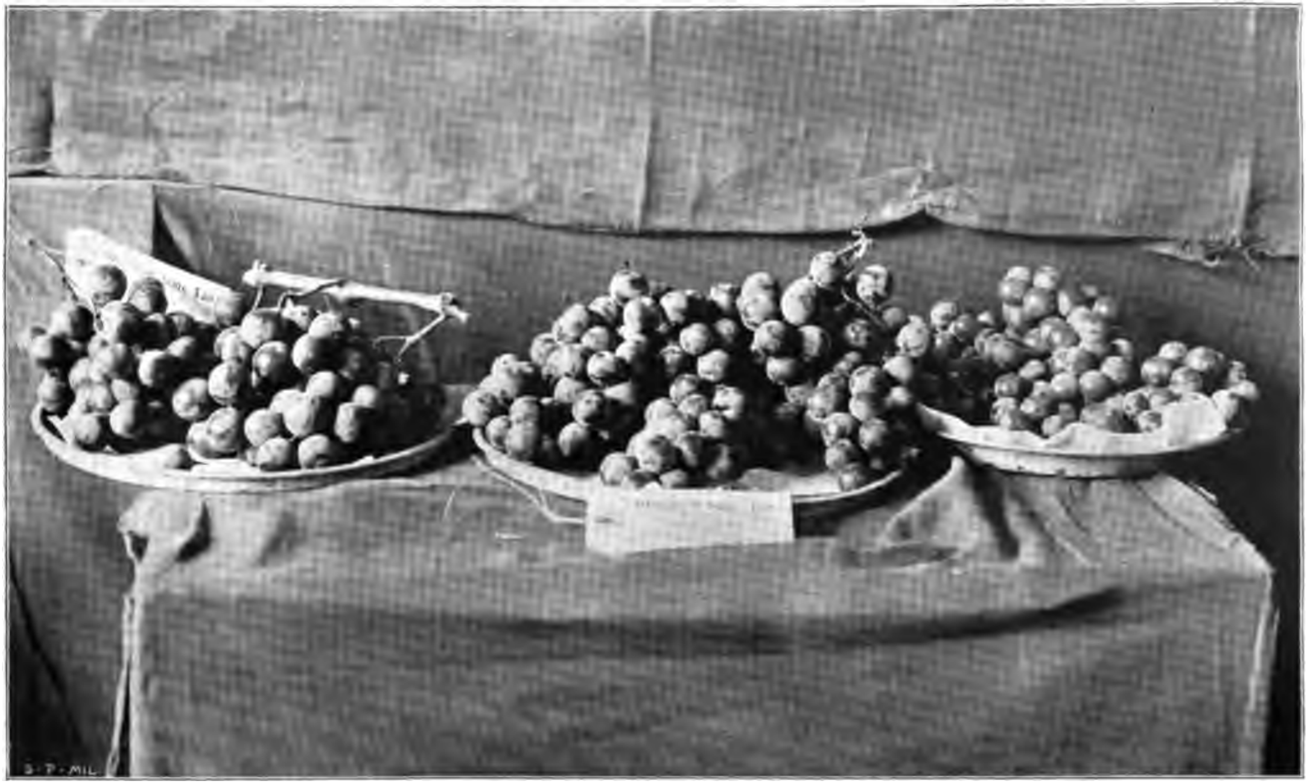
Martha.

1st Prem., John Reis	$1 00
2nd Prem., Henry Fox	50

Grapes—For Amateurs.

Display 15 varieties.

1st Prem., Mrs. Robert Ramsey	$10 00
2nd Prem., Geo. J. Jeffery	6 00



Fox's Grapes.

U of M

Display 10 varieties.

1st Prem., Mrs. Robert Ramsey	$6 00
2nd Prem., J. S. Palmer	4 00
3rd Prem., Geo. J. Jeffery	2 00

Display 5 varieties.

1st Prem., J. S. Palmer	$3 00
2nd Prem., Mrs. Robert Ramsey	2 00
3rd Prem., Geo. J. Jeffery	1 00

Canes.

Brighton.

1st Prem., Mrs. Robert Ramsey	$2 00

Concord.

1st Prem., Mrs. Robert Ramsey	$2 00

Delaware.

1st Prem., Mrs. Robert Ramsey	$2 00

Moore's Diamond.

1st Prem., J. S. Palmer	$2 00
2nd Prem., Mrs. Robert Ramsey	1 00

Worden.

1st Prem., J. S. Palmer	$2 00
2nd Prem., Mrs. Robert Ramsey	1 00

Single Plate.

Agawan.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	50

Brighton.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	50

Concord.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. J. Jeffery	50

Campbell Early.

1st Prem., Mrs. Robert Ramsey	$1 00

Delaware.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	50

Green Mountain.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	50

Lady.

1st Prem., J. S. Palmer	$1 00

Lady Washington.

1st Prem., Mrs. Robert Ramsey	$1 00

Moore's Early.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	50

Moore's Diamond.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Mrs. Robert Ramsey	50

Niagara.

1st Prem., J. S. Palmer	$1 00
2nd Prem., Geo. J. Jeffery	50

Salem.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., J. S. Palmer	50

Worden.

1st Prem., J. W. Palmer	$1 00
2nd Prem., A. A. White	50

Wilder.

1st Prem., Mrs. Robert Ramsey	$1 00

Lindley.

1st Prem., Mrs. Robert Ramsey	$1 00
2nd Prem., Geo. J. Jeffery	50

Pocklington.

1st Prem., Mrs. Robert Ramsey	$1 00

Martha.

1st Prem., Mrs. Robert Ramsey	$1 00

PLANTS AND FLOWERS.

Judge.

William Toole, Baraboo, Wis.

Professional Florists.

Collection of greenhouse plants.

1st Prem., John W. Dunlop, Waukesha, Wis	$20 00
2nd Prem., Alexander Klokner, Wauwatosa, Wis	15 00
3rd Prem., Allister Currie, Milwaukee, Wis	10 00

Display of palms.

1st Prem., Alexander Klokner	$15 00
2nd Prem., John W. Dunlop	10 00
3rd Prem., Allister Currie	5 00

Display of ferns.

1st Prem., John W. Dunlop	$5 00
2nd Prem., Alexander Klokner	3 00
3rd Prem., Allister Currie	2 00

Ten varieties of greenhouse plants.

1st Prem., John W. Dunlop	$5 00
2nd Prem., Alexander Klokner	3 00

Show of foliage plants.

1st Prem., John W. Dunlop	$5 00
2nd Prem., Alexander Klokner	3 00

Five named carnations.

1st Prem., John W. Dunlop	$3 00
2nd Prem., Alexander Klokner	2 00

Five named geraniums.

1st Prem., Alexander Klokner	$3 00
2nd Prem., John W. Dunlop	2 00

Cut Flowers.

Display wild flowers.

1st Prem., A. W. Koerner, Wauwatosa, Wis	$5 00
2nd Prem., Alexander Klokner	3 00
3rd Prem., John W. Dunlop	2 00

Display hardy phlox.

1st Prem., A. W. Koerner	$5 00
2nd Prem., Allister Currie	3 00
3rd Prem., Alexander Klokner	2 00

Floral design.

1st Prem., John W. Dunlop	$5 00
2nd Prem., A. W. Koerner	3 00
3rd Prem., Alexander Klokner	2 00

Basket of flowers.

1st Prem., John W. Dunlop	$5 00
2nd Prem., A. W. Koerner	3 00
3rd Prem., Alexander Klokner	2 00

Display cut flowers.

1st Prem., A. W. Koerner	$5 00
2nd Prem., John W. Dunlop	3 00
3rd Prem., Alexander Klokner	2 00

Display of pansies.

1st Prem., John W. Dunlop	$5 00

Display of roses.

1st Prem., Alexander Klokner	$5 00
2nd Prem., Allister Currie	3 00

Display of carnations.

1st Prem., Alexander Klokner	$3 00
2nd Prem., John W. Dunlop	2 00

Display of lilies.

1st Prem., John W. Dunlop	$3 00
2nd Prem., Hunkel's Seed Store, Milwaukee, Wis	2 00

Display of dahlias.

1st Prem., A. W. Koerner	$5 00
2nd Prem., Allister Currie	3 00
3rd Prem., Alexander Klokner	2 00

Display of cannas.

1st Prem., A. W. Koerner	$3 00
2nd Prem., Allister Currie	2 00

Display of asters.

1st Prem., John W. Dunlop	$5 00
2nd Prem., John W. Dunlop	3 00

Display of gladiolus.

1st Prem., A. W. Koerner	$5 00
2nd Prem., Alexander Klokner	3 00
3rd Prem., John W. Dunlop	2 00

Bouquet.

1st Prem., John W. Dunlop	$2 00
2nd Prem., A. W. Koerner	1 00

Display of golden glow.

1st Prem., Alexander Klokner	$2 00
2nd Prem., Allister Currie	1 00

Display of decorative grasses.

1st Prem., Alexander Klokner	$2 00
2nd Prem., Allister Currie	1 00

Display of snap-dragons.

1st Prem., Alexander Klokner	$2 00
2nd Prem., John W. Dunlop	1 00

Display of larkspur.

1st Prem., A. W. Koerner	$2 00
2nd Prem., Alexander Klokner	1 00

Display of calendula.

1st Prem., John W. Dunlop	$2 00
2nd Prem., Alexander Klokner	1 00

Display of dianthus.

1st Prem., John W. Dunlop	$2 00
2nd Prem., Allister Currie	1 00

Display of cosmos.

1st Prem., John W. Dunlop	$2 00
2nd Prem., A. W. Koerner	1 00

Display of coxcombs.

1st Prem., John W. Dunlop	$2 00
2nd Prem., Alexander Klokner	1 00

Display of hardy hydrangea.

1st Prem., John W. Dunlop	$2 00
2nd Prem., Allister Currie	1 00

For Amateur Florists.

Collection of greenhouse plants.

1st Prem., Mrs. C. E. Strong, West Allis, Wis.	$20 00
2nd Prem., Mrs. S. W. Poppe, Milwaukee, Wis.	15 00
3rd Prem., Mrs. W. P. Wegner, Milwaukee, Wis.	10 00

Display of palms.

1st Prem., Mrs. C. E. Strong	$15 00

Display of ferns.

1st Prem., Mrs. C. E. Strong	$5 00
2nd Prem., Mrs. W. P. Wegner	3 00
3rd Prem., Mary Hart, Wauwatosa, Wis.	2 00

Ten varieties of greenhouse plants in bloom.

1st Prem., Mrs. S. W. Poppe	$5 00
2nd Prem., Mrs. W. P. Wegner	3 00

Show of foliage plants.

1st Prem., Mrs. S. W. Poppe	$5 00
2nd Prem., Mrs. W. P. Wegner	3 00

Five named carnations.

1st Prem.,	Mrs. W. P. Wegner	$3 00
2nd Prem.,	Mrs. S. W. Poppe	2 00

Five named geraniums.

1st Prem.,	Mrs. C. E. Strong	$3 00
2nd Prem.,	Mrs. S. W. Poppe	2 00
3rd Prem.,	Mrs. W. P. Wegner	1 00

Cut Flowers.

Display of wild flowers.

1st Prem.,	A. A. White, Brookfield, Wis	$5 00
2nd Prem.,	Edna Stoppenback, Milwaukee, Wis	3 00
3rd Prem.,	Mrs. A. R. Radtke, Beaver Dam, Wis	2 00

Display of hardy phlox.

1st Prem.,	A. A. White	$5 00
2nd Prem.,	Mrs. S. W. Barnes, Waupaca, Wis	3 00
3rd Prem.,	Mrs. Thomas Bowes, Beaver Dam, Wis	2 00

Floral design.

1st Prem.,	Mrs. S. W. Barnes	$5 00
2nd Prem.,	Alice I. Clapp, Wauwatosa, Wis	3 00
3rd Prem.,	Mrs. W. P. Wegner	2 00

Basket of flowers.

1st Prem.,	Mrs. John J. Hannau, Milwaukee, Wis	$5 00
2nd Prem.,	Mrs. C. E. Strong	3 00
3rd Prem.,	Mrs. W. W. Rine, Pewaukee, Wis	2 00

Display of cut flowers.

1st Prem.,	Mrs. S. W. Barnes	$5 00
2nd Prem.,	Mrs. W. P. Wegner	3 00
3rd Prem.,	Mrs. Thomas Bowes	2 00

Display of pansies.

1st Prem.,	Mrs. S. W. Barnes	$5 00
2nd Prem.,	Mrs. Thomas Bowes	3 00
3rd Prem.,	Alice I. Clapp	2 00

Display of roses.

1st Prem., W. F. Pilgrim, Waukesha, Wis	$3 00
2nd Prem., Mrs. S. W. Barnes	2 00

Display of carnations.

1st Prem., Mrs. S. W. Barnes	$3 00

Display of lilies.

1st Prem., Mrs. S. W. Barnes	$3 00
2nd Prem., Mrs. A. R. Radtke	2 00

Display of dahlias.

1st Prem., Mrs. C. E. Strong	$5 00
2nd Prem., Mrs. S. W. Barnes	3 00
3rd Prem., Mrs. Thomas Bowes	2 00

Display of cannas.

1st Prem., Mrs. W. P. Wegner	$3 00
2nd Prem., Mrs. S. W. Poppe	2 00

Display of asters.

1st Prem., Ella M. Goelzer. Oakwood, Wis	$5 00
2nd Prem., Henry J. Schulte, Wauwatosa, Wis	3 00
3rd Prem., Mrs. S. W. Barnes	2 00

Display of gladiolus.

1st Prem., Mrs. W. P. Wegner	$5 00
2nd Prem., Mrs. S. W. Poppe	3 00
3rd Prem., Mrs. S. W. Barnes	2 00

Bouquet.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. John J. Hannan	1 00

Display of hardy carnations.

1st Prem., Mrs. Thomas Bowes	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Display of golden glow.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Geo. J. Jeffery, Milwaukee, Wis	1 00

Display of decorative grasses.

1st Prem., A. A. White	$2 00
2nd Prem., Mrs. S. W. Barnes	1 00

Display of snap-dragons.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Display of larkspur.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Display of calendula.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Mrs. S. W. Barnes	1 00

Display of dianthus.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Display of cosmos.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. Thomas Bowes	1 00

Display of coxcombs.

1st Prem., Mrs. S. W. Barnes	$2 00
2nd Prem., Mrs. A. R. Radtke	1 00

Display of hardy geraniums.

1st Prem., Mrs. John J. Hannan	$2 00
2nd Prem., A. A. White	1 00

Flower Beds.

Best arranged and most attractive flower beds.

1st Prem., Edw. Amerphol, Janesville, Wis.	$50 00
2nd Prem., Heitman & Baerman, Milwaukee, Wis.	40 00
3rd Prem., Rudolph Preuss, Milwaukee, Wis.	30 00
4th Prem., F. C. Kaiser, Milwaukee, Wis.	20 00
5th Prem., Alexander Klokner, Wauwatosa, Wis.	10 00

DAIRY DEPARTMENT.

BUTTER.

Judges.

Math. Michels, Madison, Wis.
M. H. Meyer, Madison, Wis.
Thos. Corneliuson, Eau Claire, Wis.

The sum of $950.00 was pro rated among the following exhibitors, according to score.

Creamery Butter.

Marion Johnson, Cedarburg, Wis.	Highest score	96
William Conway, Eagle, Wis.	Second	95.5
Math Meyer, New Holstein, Wis.	Third	95
R. L. Adams, Dousman, Wis.		91.5
A. Anderson, Greenwood. Wis.		91.5
Bert Andrea, Paoli, Wis.		94
F. W. Asherman, Lime Ridge, Wis.		92.50
Frank Bowar, Cazenovia, Wis.		94
A. A. Bauer, Fox Lake, Wis.		92.33
W. C. Boldt, Waterford, Wis.		93.5
Philip Becker, Hubertus, Wis.		91.66
O. B. Bengston, Sand Creek, Wis.		93.65
T. J. Berg, Northfield, Wis.		90.16
Joseph Bauer, Valton, Wis.		92.33
J. M. Bibby, Galesville, Wis.		92.33
Joseph Beadle, Millville, Wis.		89
H. Boerschinger, De Pere, Wis.		92.5
W. L. Becker, Edgar, Wis.		89
R. P. Christensen, St. Croix Falls, Wis.		93.33
W. J. Clark, Troy Center, Wis.		94
S, B, Cook, Bloomer, Wis.		92.33

Herman A. Curt, Salem, Wis	92.5
Allen Carswell, Clear Lake, Wis	93.83
R. J. Clark, Coloma, Wis	92.5
Walter Christensen, Darien, Wis	93.33

L. Dabareiner, Hortonville, Wis	92.66
John F. Dahl, Princeton, Wis	89.5
J. F. Dabareiner, Jefferson, Wis	92
Diedrich De Buhr, New Holstein, Wis	92.83

J. Enright, Eagle, Wis	93
Albert Ericksen, Milltown, Wis	93.5
Edmund Eckbright, Colfax, Wis	93.16
Henry Eberhardt, Brill, Wis	91.83

J. L. Frank, Sarona, Wis	92.83
H. Fassbender, Greenville, Wis	91.50
W. J. Feind, Jefferson, Wis	92.83
A. O. Fillbach, Cottage Grove, Wis	91.83

T. W. Guse, Neillsville, Wis.	92.16
Ferdinand Grimm, Chadwick, Ill	92
R. A. Gerlack, Coloma, Wis	89.66
John H. Grady, Roberts, Wis	91.33
Otto Gierach, Cedarburg, Wis	91.83
Jorgen Gormsen, Baraboo, Wis	91.83
O. J. Groth, Cedarburg	94.5

A. C. Haberstick, Medford, Wis	92
Edward Helmke, Merrill, Wis	93.83
William Haag, Malone, Wis	92
Helendale Farms, Athens, Wis	89.16
L. F. Hoppe, Brussels, Wis	92
L. P. Holgerson, Troy Center, Wis	93
A. B. Hoyt, Pewaukee, Wis	92
O. H. Hansen, Chaseburg, Wis	93.33
David Hall, Glendale, Wis	91.16
August M. Hein, Waukesha, Wis	92.33
E. T. Hammond, Baraboo, Wis	92.50
H. W. Handy, Bangor, Wis	92
C. L. Hall, Vesper, Wis	92

J. J. Jackson, Union Grove, Wis	93.5
C. J. Jensen, Richland Center, Wis	91.33
O. C. Jacobsen, Wilton, Wis	88.16

E. H. Kielsmeier, Columbus, Wis	90.16
Otto A. Kielsmeier, Manitowoc, Wis	93.33
W. H. Kubat, Humbird, Wis	92.16
Fred E. Klusendorf, Phillips, Wis	90.85
A. J. Kohn, Ellenboro, Wis	92
C. F. Lamgkilde, Geneva, Wis	90
Sever Lee, Modena, Wis	91.83
O. D. Lunstad, Burlington, Wis	91.83
G. E. Melendy, Sheboygan Falls, Wis	91.83
J. C. Miller, Augusta, Wis	92.16
Eddie Meracle, Palmyra, Wis	94
John Mortensen, Camp Douglas, Wis	92
John Mitchell, Dodgeville, Wis	87.66
J. C. Mason, Montfort, Wis	92.5
A. McLane, Whitewater, Wis	91.33
W. A. Moyse, Cazenovia, Wis	93.16
O. R. McCormick, Bancroft, Wis	92.16
J. T. Mogle, Georgetown, Wis	91.66
A. A. Miller, Ixonia, Wis	93
E. C. McCormick, Plover, Wis	91.16
John Martinick, Johnson Creek, Wis	93.16
Thomas O'Neill, Waukesha, Wis	90.66
Otto Olsen, Mt. Horeb, Wis	93.50
Lauritz Olson, De Pere, Wis	92.83
Chas. A. Prust, Jefferson, Wis	91
E. J. Pischke, New Auburn, Wis	92.83
L. A. Pollard, Blanchardville, Wis	91
F. A. Pollatier, Auroraville, Wis	90.83
A. J. Puerner, Jefferson, Wis	91.33
F. A. Rivers, Thorpe, Wis	93
H. C. Raven, Bloomer, Wis	93.66
F. E. Raven, Bloomer, Wis	93.33
H. L. Rousch, Dane, Wis	89.5
G. P. Sauer, East Troy, Wis	94.33
F. E. Snyder, Whitewater, Wis	92.63
Geo. S. Seyfert, Watertown, Wis	92.5
Erwin Schaeffer, New Holstein, Wis	91.5
Fred Sorenson, Baraboo, Wis	93
O. B. Sather, Blair, Wis	92.16

Guy Tyler, Cedarburg, Wis		89.33
William White, Spring Lake, Wis		88
T. J. Warner, Rosholt, Wis		90.16
A. F. Woodstock, Janesville, Wis		94.33
John Wyss, Medford, Wis		92.5
Wittenberg Creamery Co., Wittenberg, Wis		89.63
Glen C. Whitney, Poysippi, Wis		92.13
L. H. Winter, Chippewa Falls, Wis		91.83
A. H. Wilcox, Bloomer, Wis		93.16
G. F. Young, Ingalls, Mich		89.83
A. N. Yates, Fond du Lac, Wis		90.66
A. W. Zimmerman, Norwalk, Wis		93.33

Creamery Prints.

Bert Andrea, Paoli, Wis	Score tied	93.83
W. C. Boldt, Waterford, Wis		93
Philip Becker, Hubertus, Wis		90.63
Joseph Beadle, Millville, Wis		91.50
J. F. Dabareiner, Jefferson, Wis		92
J. Enright, Eagle, Wis		93.16
W. J. Feind, Jefferson, Wis		92.5
William Haag, Malone, Wis		93
Helendale Farms, Athens, Wis		90.5
L. P. Holgerson, Troy Center, Wis	Score tied	93.83
A. B. Hoyt, Pewaukee, Wis		88.83
August W. Hein, Waukesha, Wis		93.16
J. J. Jackson, Union Grove, Wis		93.5
E. H. Kielsmeier, Columbus, Wis		91.5
L. M. Kohel, Augusta, Wis		91.83
Otto A. Kielsmeier, Manitowoc, Wis		92.33
C. L. Langkilde, Geneva, Wis		88.66

Thomas O'Neill, Waukesha, Wis		92.5
Lauritz Olson, West De Pere, Wis		93.16
L. A. Pollard, Blanchardville, Wis		90.33
Arthur G. Puerner, Jefferson, Wis		91.66
H. P. Quackenbusch, McFarland, Wis		92
G. P. Sauer, East Troy, Wis		93.66
T. J. Warner, Rosholt, Wis		90.63
Glen C. Whitney, Poysippi, Wis		93
A. H. Wilcox, Bloomer, Wis		92.66

Dairy—Jar.

J. W. Curtis & Son, Poynette, Wis		91.16
Herman Dusell, Beaver Dam, Wis		90.5
Chas. H. Howitt, Randolph, Wis		89
W. G. Jamieson, Appleton, Wis		90.33
A. L. Kleeber, Reedsburg, Wis		89.86
Frank J. Lindley, Fox Lake, Wis		90.83
Mrs. A. W. Lehman, Woodland, Wis		88.33
H. A. Main, Fort Atkinson, Wis		92.16
Robert Pilgrim, Milwaukee, Wis		91.5
Mrs. William Sweeney, Fox Lake, Wis	Highest score	93.16

Dairy—Prints.

J. W. Curtis & Son, Poynette, Wis		91.33
A. L. Kleeber, Reedsburg, Wis		91
Frank J. Lindley, Fox Lake, Wis		90.33
Mrs. A. W. Lehmann, Woodland, Wis		90
H. A. Main, Fort Atkinson, Wis	Highest score	93.16

CHEESE.

Judges.

American Cheese.

E. L. Aderhold, Neenah, Wis.
J. W. Moore, Madison, Wis.
J. D. Cannon, New London, Wis.

Foreign Cheese.

Fred Marty, Monroe, Wis.
Peter Zumkehr, Monroe, Wis.

The sum of $1, 140.00 was pro rated among the following exhibitors, according to score.

Flats and Daisies.

H. W. Priebe, Kewaunee, Wis	Highest score	96.41
Jacob Baechler, Seymour, Wis.	Tied	96.25
W. C. Ganschow, Bonduel, Wis.		
H. W. Austin, Richland Center, Wis		91
C. A. Bahr, New Holstein, Wis		95.16
Geo. W. Bean, Kaukauna, Wis		94
Paul Borham, Tremont, Wis		93.50
Walter Bean, Green Bay, Wis		94.83
Ernst Boll, Sheboygan, Wis		95.91
August Blanck, St. Cloud, Wis		92.83
Fred Bauer, Chilton, Wis		93.83
Geo. W. Beck, Lancaster, Wis		91.83
John Bergs, Edgar, Wis		91.66
A. Benishek, Kellnersville, Wis		95.16
A. P. Boies, Osceola, Wis		93.16
Julius Berg, Sturgeon Bay, Wis		90.25
John Borkovitz, Kewaunee, Wis		95.15
Louis Blahnick, Kewaunee, Wis		94.83

C. H. Chandler, Mineral Point, Wis	91.5
R. Conrad, Haven, Wis	94.91
F. Coates, Neillsville, Wis	93.25
F. H. Carpenter, Edgar, Wis	93.65
L. L. Clark, Greenleaf, Wis	93.03
E. H. Caulson, Kewaunee, Wis	94
M. G. Douma, Cleveland, Wis	92.83
William Decker, Athens, Wis	92.08
Diedrich De Buhr, New Holstein, Wis	90 25
William Engelland, Mishicott, Wis	94.16
Otto Freund, Hilbert, Wis	94.40
O. A. Freund, Hilbert, Wis	94.33
J. A. Fuller, Lancaster, Wis	91.66
A. N. Finstad, Forestville, Wis	95
John Fagan, Stanley, Wis	89.33
F. A. Flynn, West De Pere, Wis	94.41
W. C. Ganschow, Bonduel, Wis	96.25
C. H. Good, Boscobel, Wis	91
Arnold Grimm, Fremont, Wis	93
Willie Germain, Rice Lake, Wis	84.95
P. E. Geimer, Mishicott, Wis	91.83
Fred Hadler, Greenleaf, Wis	94.83
William Haag, Malone, Wis	90.33
F. J. Haack, Casco, Wis	91.33
F. J. Harder, Hilbert, Wis	92.25
J. A. Hanchett, Modena, Wis	89 25
W. B. Hatch, Branch, Wis	92
Henry Johnson, Fairwater, Wis	91.33
U. L. Johnson, Fairwater, Wis	91.33
Albert Koopman, Port Washington, Wis	95.33
H. J. Kuschel, Weyauwega, Wis	93
J. H. Kennedy, Fremont, Wis	91.66
O. A. Kielsmeier, Manitowoc, Wis	94.66
R. C. Kielsmeier, Timothy, Wis	95.75
J. F. Kalk, Haven, Wis	95.50
W. J. Knappmiller, Soldiers Grove, Wis	92.08
J. J. Kuhn, Cleveland, Wis	91.66
Oscar Knutsen, Montfort, Wis	91.66

J. B. Kurtz, Suring, Wis	91.58
Geo. J. Kust, Dorchester, Wis	94.66
Richard Kohlman, Fond du Lac, Wis	91.03
A. H. Knoke, Birnamwood, Wis	94.83
Frank Kleiner, Hortonville, Wis	95.5

William C. Lindow, Plymouth, Wis.	94.41
J. F. LeJeune, Corinth, Wis	92.16
Anton Loehr, St. John, Wis	94.83
J. B. Linsmeier, Angelica, Wis	94
Emil J. Lorenz, Reedsville, Wis	92.33
Math M. Leick, Kewaunee, Wis	95.16

G. M. Matznick, Kiel, Wis	94.08
A. B. Mayhew, Clintonville, Wis	94.66
Math Meyer, New Holstein, Wis	95.5
Gottlieb Muehleisen, Tell, Wis	88.66
Willard Mortensen, Clintonville, Wis	96.08
Bert McKinney, Muscoda, Wis	94.5
J. F. McCoskey, Peshtigo, Wis	94.33
W. F. Miller, Muscoda, Wis	91.5
R. W. Mossholder, Merrill, Wis	93.16
Otto Mossholder, Welcome, Wis	94.75
E. B. Mayhew, Greenbush, Wis	93.03
H. W. Melchert, Seymour, Wis	94.5

Robert Nauman, Two Rivers, Wis	95.60
F. W. Nussbaumer, Waldo, Wis	94.75
A. Nachtweg, Dorchester, Wis	93.66

A. J. Oleson, Montfort, Wis	95
William Ouradnik, Kewaunee, Wis	95.83

A. F. Peterson, Appleton, Wis	95.25
N. E. Possley, New Holstein, Wis	93.66
F. C. Pulaski, Neillsville, Wis	90.33
C. H. Patt, Van Dyne, Wis	91.83
Wenzel Papeham, Kewaunee, Wis	95.16
H. W. Priebe, Kewaunee, Wis	96.41

A. R. Radtke, Leopolis, Wis	93.33
F. W. Riedel, Hilbert, Wis	94.25
N. W. Kopp, South Kaukauna, Wis	95
Chas. Rasmussen, Wild Rose, Wis	91.50
Gerhard Rusch, Welcome, Wis	88.83
R. H. Radtke, Marion, Wis	93.58
Marcus Rappel, Cato, Wis	92.42

Christian Schneider, Dana, Ia	68.66
William Sy, Jr., Kiel, Wis	94
H. A. Sonnabend, Sherwood, Wis	95.5
E. O. Siggelkow, Cleveland, Wis	95.3
Alex J. Schulte, Plymouth, Wis	94.16
T. W. Schreiber, Kiel, Wis	93.08
William Stearns, Standart, Wis	92.5
E. A. Siggelkow, Cleveland, Wis	94.41
Adam J. Schmelzer, Avoca, Wis	90.83
R. H. Sample, Merrill, Wis	92
Henry Schneider, Unity, Wis	90.66
J. J. Stocker, Dale, Wis	90.16
H. A. Stearns, Antigo, Wis	94.5
O. R. Schwantes, Sugar Bush, Wis	92.41
L. A. Schneider, Algoma, Wis	94.5

Elmer TerMaat, Hilbert, Wis	90.5
J. A. Thiede, Bonduel, Wis	94.5
Floyd Tisdale, Richland Center, Wis	95.6

T. A. Uebbelohde, Glen Beulah, Wis	94.83

F. A. Viergutz, Appleton, Wis	96.16
J. A. Van Epps, Fremont, Wis	94.83

Ed Wuensch, Haven, Wis	94.5
August F. Westphal, Neosho, Wis	94.16
M. J. Wagner, Rice Lake, Wis	95.5
J. J. Warneck, Rice Lake, Wis	89.25
Lute Wooden, Clintonville, Wis	95.83

W. A. Zietlow, Marion, Wis	96.16

Young America and Long Horn.

Chas. Ahlswede, Manitowoc, Wis	91.33

C. A. Bahr, New Holstein, Wis	93.5
Ernest Boll, Sheboygan, Wis	94.66
A. P. Boies, Osceola, Wis	94.33

R. Conrad, Haven, Wis	95.33

M. G. Douma, Cleveland, Wis	91.58

William Engelland, Mishicott, Wis		92
Otto Freund, Hilbert, Wis		94.5
O. A. Freund, Hilbert, Wis		95.41
Arnold Grimm, Fremont, Wis		88.83
A. P. Geiger, Stanley, Wis		92.16
Albert Koopman, Port Washington, Wis		89.83
O. A. Kielsmeier, Manitowoc, Wis		94.16
R. C. Kielsmeier, Timothy, Wis		94.08
H. A. Kalk, Sheboygan, Wis		92.08
W. C. Lindow, Plymouth, Wis		93
Anton Loehr, St. John, Wis		92.75
Herman C. Lange, Plymouth, Wis		93.83
Ed Maedke, Stanley, Wis		92.25
Math. Meyer, New Holstein, Wis	Highest score	96.1
H. L. Mueller, Sheboygan Falls, Wis		91.33
Robert Nauman, Two Rivers, Wis		96.08
F. W. Nussbaumer, Waldo, Wis		93.25
F. W. Riedel, Hilbert, Wis		95.5
N. L. Rupp, South Kaukauna, Wis		93.5
H. A. Sonnabend, Sherwood, Wis		94.83
A. J. Schulte, Plymouth, Wis		93.5
T. W. Schreiber, Kiel, Wis		94.16
E. A. Siggelkow, Cleveland, Wis		95.33
J. J. Stocker, Dale, Wis		92.66
William Teske, Spruce, Wis		89.66
Ed. Wuensch, Haven, Wis		95.66
F. A. Viergutz, Appleton, Wis		94.41
William Zimmerman, Haven, Wis		95.5

Cheddars.

Louis Falck, Morrison, Wis		93.66
Fred Hadler, Greenleaf, Wis		93.5
John Kennedy, Fremont, Wis		92.33
Anton Loehr, St. John, Wis		92.25
A. B. Mayhew, Clintonville, Wis		94.63
W. Mortensen, Clintonville, Wis		96
Math. Meyer, New Holstein, Wis		94.66
Robert Nauman, Two Rivers, Wis		94.25
Alex J. Schulte, Plymouth, Wis		93.66
F. A. Viergutz, Appleton, Wis	Highest score	96.5
Ed. Wuensch, Haven, Wis		95.5
W. S. Walsh, Montfort, Wis		93.5
J. L. Zehren, Marion, Wis		95.5

Brick.

Casper Anderegg, La Crosse, Wis	93.25
Chris Bigler, Clayton, Wis	92
E. R. Ebert, Juneau, Wis	90
Louis Hasse, Juneau, Wis	96.5
Fred Koller, Tell, Wis	92.5
Robert Kohli, Knowles, Wis	93.75
Otto Kumm, La Crosse, Wis	94
Gottlieb Muehleisen, Tell, Wis	92
J. Rothenbach, Ackerville, Wis	91.5

F. Sette, Iron Ridge, Wis		94
Aug. F. Westphal, Necsho, Wis	Highest score	97.5

Swiss.

J. Baumberger, Gratiot, Wis	Highest score	95.75
J. W. Main, Barneveld, Wis		93.5
Gottfried Vogel, Mt. Horeb, Wis		92.75

Limburger.

Jacob Adler, Blanchardville, Wis		96.5
Jacob Andrea, Monticello, Wis		94.5
John Altman, Mineral Point, Wis		94.75
Franz Chinger, Belleville, Wis		95
E. Haessig, Brooklyn, Wis	Highest score	96.75

ART.

Judge.

Louis Mayer, Milwaukee, Wis.

OIL PAINTINGS.

Portrait or figure from nature.

1st Prem., Francisco Spicuzza, Milwaukee, Wis	$15 00
2nd Prem., Frederick Heckman, Milwaukee, Wis	10 00
3rd Prem., C. H. Boettcher, Milwaukee, Wis	5 00

Animal from nature.

No first.	
2nd Prem., Frederick Stoltenberg, Milwaukee, Wis	$10 00
3rd Prem., Marjorie Falbe, Wauwatosa, Wis	5 00

Landscape or marine from nature.

1st Prem., G. Busalachi, Milwaukee, Wis	$15 00
2nd Prem., C. H. Boettcher	10 00
3rd Prem., Hans J. Stoltenberg, Milwaukee, Wis	5 00

Still life from nature.

1st Prem., Frederick Heckman	$15 00
2nd Prem., C. H. Boettcher	10 00
3rd Prem., Francisco Spicuzza	5 00

Water Color or Pastel.

Portrait or figure from nature.

1st Prem., Francisco Spicuzza	$10 00
2nd Prem., Frederick Heckman	6 00
3rd Prem., C. H. Boettcher	4 00

Landscape or marine from nature.

1st Prem., Francisco Spicuzza	$10 00
2nd Prem., G. Busalachi	6 00

Still life in colors.

1st Prem., Francisco Spicuzza	$10 00
2nd Prem., C. H. Boettcher	6 00
3rd Prem., W. J. Wittich, Milwaukee, Wis	4 00

Drawings.

Portrait or figure from nature.

1st Prem., Francisco Spicuzza	$5 00
2nd Prem., Frederick Heckman	3 00
3rd Prem., Ruth R. Shutts, Whitewater, Wis	2 00

Animal from nature.

1st Prem., A. M. Johnson, West Allis, Wis	$5 00

Landscape from nature.

1st Prem., Ruth R. Shutts	$5 00
2nd Prem., C. H. Boettcher	3 00

Still life or cast from nature.

1st Prem., Frederick Heckman	$5 00
2nd Prem., Ruth R. Shutts	3 00

Copies.

Portrait or figure (in oil).

1st Prem., Marjorie Falbe	$5 00
2nd Prem., Eugenie Schoen, Milwaukee, Wis	3 00
3rd Prem., Mathilda G. Schley, Milwaukee, Wis	2 00

Animal (in oil).

1st Prem., W. J. Wittich	$5 00
2nd Prem., Mathilda G. Schley	3 00
3rd Prem., Marjorie Falbe	2 00

Landscape or marine (in oil).

1st Prem., Mathilda G. Schley	$5 00
2nd Prem., Frederick Heckman	3 00
3rd Prem., Marjorie Falbe	2 00

Still life (in oil.)

No first.

2nd Prem., Grace H. Martin, Wauwatosa, Wis	$3 00
3rd Prem., George Illian, Milwaukee, Wis	2 00

Water color.

1st Prem., George Illian	$3 00

Pastel.

1st Prem., Edna Stoppenbach, Milwaukee, Wis	$3 00

Crayon or charcoal drawing.

1st Prem., Franklin Lyons, Milwaukee, Wis	$3 00

Pen and ink drawing.

1st Prem., Claude Tyrell, Milwaukee, Wis	$3 00

Photographs.

Collection—not less than five.

1st Prem., B. F. Lamgland, Milwaukee, Wis	$15 00
2nd Prem., J. H. Field, Berlin, Wis	10 00
3rd Prem., B. C. Roloff, Milwaukee, Wis	5 00

Single exhibit.

1st Prem., J. H. Field	$10 00
2nd Prem., B. F. Langland	5 00
3rd Prem., Nick Bruehl, Sherwood, Wis	2 00

Arts and Crafts.

Collection of designs for book-cover, wall-paper, etc.

1st Prem., Frederick Heckman	$15 00
2nd Prem., C. H. Boettcher	10 00
3rd Prem., A. L. White, Oconomowoc, Wis	5 00

Specimen of wood carving, original.

No first.	
2nd Prem., Ruth R. Shutts	$3 00
3rd Prem., Geo. J. Ross, Franksville, Wis	2 00

Specimen carved or raised leather work, original design.

1st Prem., A. L. White	$5 00
2nd Prem., Ruth R. Shutts	3 00

Specimen carved or raised leather work, copied design.

1st Prem., Mrs. A. E. Pierce, Milwaukee, Wis	$2 00

Specimen of pyrography, original design.

No first.	
2nd Prem., Mrs. H. M. Sorg, Milwaukee, Wis	$3 00
3rd Prem., Mrs. R. Wendland, Milwaukee, Wis	2 00

Specimen of pyrography, copied design.

1st Prem., Armand R. Tibbits, Waukesha, Wis	$2 00
2nd Prem., Mrs. R. Wendland	1 00

Specimen needlework, original design.

1st Prem., Mrs. E. Lindquist, Milwaukee, Wis	$5 00
2nd Prem., Mrs. B. F. Yost, Milwaukee, Wis	3 00

Specimen hand-weaving or drawn work, original design.

No first.	
No second.	
3rd Prem., Mrs. W. W. Paine, Pewaukee, Wis	$2 00

Specimen of raffia work, original design.

1st Prem., Ruth R. Shutts	$5 00

China Painting.

Collection—not less than 20 pieces.

1st Prem., Mrs. E. A. Arthur, Green Bay, Wis	$25 00
2nd Prem., Mrs. P. M. Kynaston, Milwaukee, Wis	15 00

Collection—10 to 20 pieces.

1st Prem., Mrs. E. A. Arthur	$20 00
2nd Prem., Mrs. P. M. Kynaston	12 00

Set—6 to 10 pieces.

1st Prem., Mrs. E. A. Arthur	$15 00
2nd Prem., Mrs. E. E. Mills, Madison, Wis	10 00
3rd Prem., Mrs. P. M. Kynaston	6 00

Set—3 to 6 pieces.

1st Prem., Mrs. E. A. Arthur	$12 00
2nd Prem., Mrs. E. E. Mills	8 00

Set—2 pieces.

1st Prem., Mrs. H. W. Haskell, Milwaukee, Wis	$8 00
2nd Prem., Mrs. E. A. Arthur	5 00
3rd Prem., Mrs. P. M. Kynaston	2 00

Single bowl.

1st Prem., Mrs. P. M. Kynaston	$15 00
2nd Prem., Mrs. O. F. Priebe	10 00

Single vase.

1st Prem., Mrs. E. E. Mills	$10 00
2nd Prem., Mrs. P. M. Kynaston	6 00
3rd Prem., Mrs. L. C. Baker, Green Bay, Wis	4 00

Single plaque or platter.

1st Prem., Mrs. P. M. Kynaston	$10 00
2nd Prem., Mrs. L. C. Baker	6 00
3rd Prem., Mrs. J. W. Cutler, Milwaukee, Wis	4 00

Single specimen.

1st Prem., Mrs. E. A. Arthur	$6 00
2nd Prem., Mrs. P. M. Kynaston	4 00
3rd Prem., Mrs. E. E. Mills	2 00

WOMAN'S WORK.

NEEDLE WORK DIVISION.

Judge.

Miss Dora Bunteschu, Milwaukee, Wis.

Drawn Work.

Tablecloth and six napkins.

1st Prem., Mrs. E. C. Hoffman, Jefferson, Wis	$3 00
2nd Prem., Mrs. Hy Fischer, Jefferson, Wis	2 00

Lunch cloth.

1st Prem., Mrs. E. C. Hoffman	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Sideboard cover.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Carving cloth.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Centerpiece.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. Giles Hibbard, Fort Atkinson, Wis	1 00

Six doilies.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Three handkerchiefs.

1st Prem., Mrs. Hy Fischer	$2 00

Pair towels.

1st Prem., Mrs. E. C. Hoffman	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Sheet and pair pillow cases.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Shirt waist.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Sofa pillow, complete.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. C. Hoffman	1 00

Embroidery.

Sheet and pair pillow cases.

No first.

2nd Prem., Minnie Dykins, Milwaukee, Wis	$1 00

Pair towels.

1st Prem., Edna M. Simonton, La Crosse, Wis	$2 00
2nd Prem., Mrs. Martin Dreyfus, Milwaukee, Wis	1 00

Six napkins.

1st Prem., Mrs. W. P. Wegner, Milwaukee, Wis	$2 00
2nd Prem., Mrs. W. W. Paine, Pewaukee, Wis	1 00

Lunch cloth, in white.

1st Prem., Ida Waecker, La Crosse, Wis	$2 00
2nd Prem., Ida L. Kuehn, Jefferson, Wis	1 00

Lunch cloth, in tints.

1st Prem., Mrs. F. McAneny, Milwaukee, Wis	$2 00
2nd Prem., Mrs. J. Kernely, Milwaukee, Wis	1 00

Centerpiece, in white.

1st Prem., Mrs. A. H. Bartz, Milwaukee, Wis	$2 00
2nd Prem., Ida L. Kuehn	1 00

Centerpiece, in tints.

1st Prem., Alice Glowinske, Muskego Center, Wis	$2 00
2nd Prem., Clara Mueller, Milwaukee, Wis	1 00

Sideboard cover.

1st Prem., Ida Waecker	$2 00
2nd Prem., Mrs. C. C. Barrett, Edgar, Wis	1 00

Carving cloth.

1st Prem., Mrs. Neil McFayden, Beaver Dam, Wis	$2 00
2nd Prem., Mrs. W. E. Lamgenberg, Stevens Point, Wis	1 00

Six plate doilies.

No first.	
2nd Prem., Mrs. R. Wendland, Milwaukee, Wis	$1 00

Three handkerchiefs.

1st Prem., Edna M. Simonton	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Collar and cuffs.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Corset cover.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Mrs. R. Wendland	1 00

Table cover in cross stitch.

1st Prem., Mrs. Giles Hibbard	$2 00
2nd Prem., Carrie J. Smith, Fort Atkinson, Wis	1 00

Mt. Mellick Embroidery.

Centerpiece.

1st Prem., Ida L. Waecker	$2 00
2nd Prem., Mrs. I. N. Betten, Milwaukee, Wis	1 00

Lunch cloth.

No first.	
2nd Prem., Ida L. Waecker	$1 00

English Eyelet Embroidery.

Dress.

1st Prem., Harriette Evans, Milwaukee, Wis	$3 00
2nd Prem., Mrs. Addie M. Witte, Waukesha, Wis	2 00

Shirt waist.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Alma Biegelaar, Milwaukee, Wis	1 00

Lunch cloth.

No first.	
2nd Prem., Ida L. Waecker	$1 00

Centerpiece.

1st Prem., Harriet E. Zaun, Milwaukee, Wis	$2 00
2nd Prem., Mrs. Addie M. Witte	1 00

Six doilies.

1st Prem., Mrs. W. E. Langenberg	$2 00
2nd Prem., Mrs. Susie Abert, Milwaukee, Wis	1 00

Sheet and pair pillow cases.

No first.	
2nd Prem., Ida L. Waecker	$1 00

Sofa pillow, complete.

1st Prem., Harriet E. Zaun	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Hardanger Embroidery.

Shirt Waist.

1st Prem., Mrs. T. W. Baker, Waunakee, Wis	$2 00
2nd Prem., Mrs. Giles Hibbard	1 00

Two or more doilies.

1st Prem., Marion E. Keogh, Milwaukee, Wis	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Centerpiece.

1st Prem., Marion E. Keogh	$2 00
2nd Prem., Mrs. James E. Rogers, Waukesha, Wis	1 00

Lunch cloth.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. James E. Rogers	1 00

Dresser scarf.

1st Prem., Mrs. Frank Remlinger, Milwaukee, Wi	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Commode scarf.

No first.

2nd Prem., Mrs. W. E. Langenberg	$1 00

Sofa pillow, complete.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Marion E. Keogh	1 00

Coronation Cord Embroidery.

Shirt waist.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Centerpiece.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Ida L. Waecker	1 00

Coronation Cord Applique.

Centerpiece.

No first.

2nd Prem., Mrs. W. E. Langenberg	$1 00

Sofa pillow, complete.

No first.

2nd Prem., Mrs. W. P. Wegner	$1 00

Wallachian Embroidery.

Lunch cloth.

No first.

2nd Prem., Ida L. Waecker	$1 00

Centerpiece, in white.

No first.

2nd Prem., Ida L. Waecker	$1 00

Centerpiece, in colors.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Shadow Embroidery.

Apron.

1st Prem., Mrs. W. E. Langenberg	$2 00
2nd Prem., Mrs. M. Casperson, Wauwatosa, Wis.	1 00

Corset cover.

1st Prem., Mrs. W. E. Langenberg	$2 00
2nd Prem., Mrs. R. Wendland	1 00

Shirt waist.

1st Prem., Mrs. M. Casperson	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Sofa pillow, complete.

No first.

2nd Prem., Edna M. Simonton	$1 00

Biedermeier Embroidery.

Tea cloth.

No first.

2nd Prem., Mrs. W. E. Langenberg	$1 00

Sofa pillow, complete.

No first.

2nd Prem., Edna M. Simonton	$1 00

Repousse Braid Embroidery.

Centerpiece, in white.

1st Prem., Ida L. Kuehn	$2 00
2nd Prem., Mrs. W. E. Langenberg	1 00

Table cover, in colors.

No first.

2nd Prem., Carrie J. Smith	$1 00

Sofa pillow, in colors, complete.

1st Prem., Harriet E. Zaun	$2 00
2nd Prem., Ida L. Kuehn	1 00

Silk Ribbon Embroidery.

Sofa pillow, complete.

No. first.

2nd Prem., Ida L. Kuehn	$1 00

Embroidery on Burlap.

Table cover, worked in silk or cotton.

1st Prem., Edna Stoppenbach, Milwaukee, Wis	$2 00
2nd Prem., Edna Stoppenbach	1 00

Sofa pillow, worked in silk or cotton.

No first.

2nd Prem., Edna M. Simonton	$1 00

Lazy Daisy Embroidery.

Centerpiece.

1st Prem., Mrs. E. C. Hoffman	$2 00
2nd Prem., Ida L. Kuehn	1 00

Sofa pillow, complete.

1st Prem., Mrs. Giles Hibbard	$2 00
2nd Prem., Ida L. Kuehn	1 00

Roman Embroidery.

Sideboard cover.

No first.

2nd Prem., Mrs. E. C. Hoffman	$1 00

Miscellaneous Pillows.

Embroidered pillow, in white.

1st Prem., Harriet E. Zaun	$2 00

Embroidered pillow, in tints.

1st Prem., Mrs. R. Wendland	$2 00
2nd Prem., Alma Bigelaar	1 00

Bulgarian pillow.

1st Prem., Edna M. Simonton	$2 00
2nd Prem., Mrs. Neil McFayden	1 00

College or athletic pillow.

No first.

2nd Prem., Edna M. Simonton	$1 00

Poster pillow.

1st Prem., Mrs. B. Herman, Milwaukee, Wis	$2 00
2nd Prem., Mrs. S. W. Poppe, Milwaukee, Wis	1 00

Cross stitch pillow.

1st Prem., Alice I. Clapp, Wauwatosa, Wis	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Baby pillow.

1st Prem., Mrs. W. E. Langenberg	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Lace.

Point Lace Collar.

1st Prem., Mrs. W. W. Paine, Pewaukee, Wis	$2 00
2nd Prem., Mrs. Hy. Fischer	1 00

Carrickmacross collar.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Carrie J. Smith	1 00

Carrickmacross bertha.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Carrie J. Smith	1 00

Cluny lace collar and cuffs.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Two point lace handkerchiefs.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. W. W. Paine	1 00

Two handkerchiefs, one flemish braid, one honiton braid.

No first.

2nd Prem., Mrs. Susie Abert	$1 00

Child's bonnet.

No first.

2nd Prem., Mrs. Susie Abert	$1 00

Battenburg Lace.

Centerpiece.

1st Prem., Minnie Dykins	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Lunch cloth.

1st Prem., Mrs. Chas. L. Wood, Milwaukee, Wis	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Dresser scarf.

1st Prem., Alma Bigelaar	$2 00
2nd Prem., Carrie J. Smith	1 00

Piano scarf.

1st Prem., Anna Ludwig, Milwaukee, Wis	$2 00
2nd Prem., Mrs. W. E. Langenberg	1 00

Bolero.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Curtains.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. Chas. L. Wood	1 00

Sofa pillow, complete.

No first.	
2nd Prem., Minnie Dykins	$1 00

Honiton Lace.

Six doilies.

1st Prem., Mrs. M. Casperson	$2 00
2nd Prem., Edna Stoppenbach	1 00

Centerpiece.

No first.	
2nd Prem., Mrs. Neil McFadyen	$1 00

Child's bonnet.

No first.	
2nd Prem., Mrs. W. E. Langenberg	$1 00

Tatting.

Collar.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Mrs. James E. Rogers	1 00

Handkerchief.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Mrs. W. E. Langanberg	1 00

Child's bonnet.

No first.	
2nd Prem., Mrs. W. E. Langenberg	$1 00

KNITTING.

Knitting—Plain Stitch.

Shawl.

1st Prem., Mary Hart, Wauwatosa, Wis	$2 00
2nd Prem., Mrs. W. E. Langenberg	1 00

Fascinator.

1st Prem., Lucy Cavell, Whitewater, Wis	$2 00
2nd Prem., Mrs. Martin Dreyfus	1 00

Baby's socks or shoes.

1st Prem., Mrs. Anna L. Corwith, Reedsburg, Wis	$2 00
2nd Prem., Mrs. Anna L. Corwith	1 00

Hood or cap.

1st Prem., Edna M. Simonton	$2 00
2nd Prem., Mrs. Anna L. Corwith	1 00

Mittens, wool.

1st Prem., Mrs. John Hans, Jefferson, Wis	$2 00
2nd Prem., Edna Stoppenbach	1 00

Gloves, wool.

1st Prem., Mrs. W. Claridge, Reedsburg, Wis	$2 00

Stockings, wool.

1st Prem., Mrs. John Hans	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Socks, wool.

1st Prem., Mrs. Anna L. Corwith	$2 00
2nd Prem., Edna Stoppenbach	1 00

Leggings, wool.

1st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Slippers or shoes.

No first.

2nd Prem., Edna Stoppenbach	$1 00

Lady's sweater.

1st Prem., Mrs. Susie Abert	$2 00

Lounge or carriage robe.

1st Prem., Mrs. L. Yanke, Waukesha, Wis	$2 00

Counterpane.

1st Prem., Mrs. F. Wakefield, Milwaukee, Wis	$2 00

Knitting—Fancy Stitch.

Fascinator.

1st Prem., Mrs. Susie Abert	$2 00

Baby's sack.

No first.

2nd Prem., Mrs. R. Wendland	$1 00

Baby's socks or shoes.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. W. Claridge	1 00

Fancy hood or cap.

1st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Mittens, silk.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Alma Bigelaar	1 00

Mittens, wool.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Gloves, wool.

1st Prem., Mrs. Anna L. Corwith	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Stockings, wool.

1st Prem, Mrs. Christian G. Lee, Baraboo, Wis	$2 00
2nd Prem., Mrs. Giles Hibbard	1 00

Socks, wool.

1st Prem., Mrs. Christian G. Lee	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Slippers or shoes.

1st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Child's skirt.

1st Prem., Mrs. Christian G. Lee	$2 00
2nd Pfem., Mrs. Hy Fischer	1 00

Lady's skirt.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Lucy Cavell	1 00

Lady's sweater.

1st Prem., Mrs. Christian G. Lee	$2 00

Lounge or carriage robe.

No first.	
2nd Prem., Mrs. J. N. Hommel, Milwaukee, Wis	$1 00

Counterpane.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. J. C. Thomson, Milwaukee, Wis	1 00

Irish Crochet.

Shirt waist.

1st Prem., Mrs. Susie Abert	$2 00

Two or more yards of lace and insertion.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

CROCHET.

Crochet—Plain Stitch.

Shawl.

1st Prem., Mrs. R. Wendland	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Fascinator.

1st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Baby's sack.

1st Prem., Mrs. Susie Abert	$2 00
2nd Prem., Lucy Cavell	1 00

Child's bonnet.

st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Child's skirt.

1st Prem., Mrs. Susie Abert	$2 00
2nd Prem., Mrs. R. Wendland	1 00

Lady's skirt.

No first.

2nd Prem., Alma Bigelaar	$1 00

Slippers or shoes.

1st Prem., Mrs. Susie Abert	$2 00
2nd Prem., Mrs. Anna L. Corwith	1 00

Lounge or carriage robe.

1st Prem., Alma Bigelaar	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Counterpane.

1st Prem., Alma Bigelaar	$2 00

Crochet—Fancy Stitch.

Shawl.

1st Prem., Lucy Cavell	$2 00
2nd Prem., Mrs. J. N. Hommel	1 00

Fascinator.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs Susie Abert	1 00

Baby's sack.

1st Prem., Mrs. Susie Abert	$2 00
2nd Prem., Mrs. Hy Fischer	1 00

Baby's socks or shoes.

1st Prem., Mrs. W. E. Langenberg	$2 00
2nd Prem., Mrs. T. W. Baker	1 00

Child's bonnet.

1st Prem., Mrs. W. E. Langenberg	$2 00

Child's skirt.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Lady's skirt.

1st Prem., Mrs. E. Paglow, Milwaukee, Wis	$2 00

Counterpane.

No first.

2nd Prem., Mrs. Frank Remlinger, Milwaukee, Wis	$1 00

Domestic Manufacture.

Fancy purse.

1st Prem., Edna M. Simonton	$2 00
2nd Prem., Mrs. Susie Abert	1 00

Collar case.

No first.

2nd Prem., Mrs. W. E. Langenberg	$1 00

Necktie case.

No first.

2nd Prem., Mrs. W. E. Langenberg	$1 00

Glove case.

No first.

2nd Prem., Alma Bigelaar	$1 00

Handkerchief case.

1st Prem., Mrs. W. E. Langenberg	$2 00

Pin cushion.

1st Prem., Mrs. Chas. H. Wood	$2 00
2nd Prem., Harriet E. Zaun	1 00

Lady's fancy apron.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. Neil McFadyen	1 00

Child's apron.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. E. W. Karrer, Milwaukee, Wis	1 00

Child's dress.

1st Prem., Mrs. Hy Fischer	$2 00
2nd Prem., Mrs. C. C. Barrett	1 00

Traveling bag or case.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Shopping bag.

1st Prem., Mrs. T. W. Baker	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Stocking bag.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Laundry bag.

1st Prem., Mrs. C. C. Barrett	$2 00
2nd Prem., Mrs. W. E. Langenberg	1 00

Kitchen apron.

1st Prem.,	Carrie J. Smith	$2 00
2nd Prem.,	Mrs. R. Wendland	1 00

Specimen patched mending.

1st Prem.,	Edna Stoppenbach	$2 00
2nd Prem.,	Mrs. Susie Abert	1 00

Specimen darned mending.

1st Prem.,	Edna Stoppenbach	$2 00
2nd Prem.,	Mrs. Giles Hibbard	1 00

Pieced quilt, quilted.

1st Prem.,	Mrs. W. W. Paine	$2 00
2nd Prem.,	Mrs. I. N. Batten	1 00

Log cabin quilt, quilted.

1st Prem.,	Mrs. Chas. H. Wood	$2 00
2nd Prem.,	Katie Bodden, Milwaukee, Wis	1 00

Log cabin quilt, silk.

1st Prem.,	Alma Bigelaar	$2 00
2nd Prem.,	Mrs. Addie M. Witte	1 00

Silk crazy quilt.

1st Prem.,	Mrs. I. N. Betten	$2 00
2nd Prem.,	Alma Bigelaar	1 00

Hand drawn rug.

1st Prem.,	Mrs. L. W. Barnes, Waupaca, Wis	$2 00
2nd Prem.,	Mrs. L. Yanke	1 00

Three or more yards of rag carpet.

1st Prem.,	Mrs. Christian G. Lee	$2 00
2nd Prem.,	Mrs. Christian G. Lee	1 00

CULINARY DIVISION.

Judge.

Mrs. Louise H. Bowerman, Janesville, Wis.

Pantry Stores.

White bread.

1st Prem., Mrs. R. C. Smith, West Allis, Wis	$2 00
2nd Prem., Mrs. E. W. Karrer	1 00

Boston brown bread.

1st Prem., Alice I. Clapp, Wauwatcsa, Wis	$2 00
2nd Prem., Alice I. Clapp	1 00

Rye bread.

1st Prem., Mrs. L. Yanke, Waukesha, Wis	$2 00
2nd Prem., Mrs. S. W. Poppe, Milwaukee, Wis	1 00

Graham bread.

1st Prem., Alice I. Clapp	$2 00
2nd Prem., Alice I. Clapp	1 00

Nut bread.

1st Prem., Mrs. A. A. White, Brookfield, Wis	$2 00
2nd Prem., Alice I. Clapp	1 00

Whole wheat bread.

1st Prem., Adelaide O'Keefe, Milwaukee, Wis	$2 00
2nd Prem., Alice I. Clapp	1 00

Parker House rolls.

1st Prem., Mrs. P. DeBruine, West Allis, Wis	$2 00
2nd Prem., Mrs. Frank Granger, Cadhoun, Wis	1 00

Baking powder biscuits.

1st Prem., Mrs. William Sweeney, Fox Lake, Wis	$2 00
2nd Prem., Mrs. P. DeBruine	1 00

Loaf Cake.

Dark fruit cake.

1st Prem., Mrs. E. L. Douville, West Allis, Wis	$2 00
2nd Prem., Mrs. John Hans, Jefferson, Wis	1 00

White fruit cake.

1st Prem., Mrs. Frank Granger	$2 00

Devil's food cake.

1st Prem., Mrs. A. A. White	$2 00
2nd Prem., M. Riordan, Milwaukee, Wis	1 00

Angel food cake.

1st Prem., Mrs. R. Wendland	$2 00
2nd Prem., Mary Pitzka, Waukesha, Wis	1 00

Sunshine cake.

1st Prem., Mrs. Martin Dreyfus	$2 00
2nd Prem., Adelaide O'Keefe	1 00

Nut cake.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. John Hans	1 00

Date cake.

1st Prem., Mrs. A. A. White	$2 00
2nd Prem., Mary Pitzka	1 00

Coffee cake.

1st Prem., Mrs. John Hans	$2 00
2nd Prem., Mrs. William Sweeney	1 00

Layer Cakes.

Ribbon cake.

1st Prem., Mary Pitzka	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Chocolate cake.

1st Prem., Mrs. E. L. Douville	$2 00
2nd Prem., Alma A. Wolff, Milwaukee, Wis	1 00

Cocoanut cake.

1st Prem., Mrs. L. Yanke	$2 00
2nd Prem., Mary Pitzka	1 00

Fig cake.

1st Prem., Mary Pitzka	$2 00
2nd Prem., Mrs. L. Yanke	1 00

Orange cake.

1st Prem., Mary Pitzka	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Layer cake with nut filling.

1st Prem., Mrs. E. L. Douville	$2 00
2nd Prem., Mary Pitzka	1 00

Cookies.

White cookies.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Alice I. Clapp	1 00

Dark cookies.

1st Prem., Mrs. A. A. White	$2 00
2nd Prem., Mrs. W. W. Paine	1 00

Oatmeal cookies.

1st Prem., Mrs. John Hans	$2 00
2nd Prem., Mrs. R. Wendland	1 00

Rock cookies.

1st Prem., Adelaide O'Keefe	$2 00
2nd Prem., Mrs. L. Yanke	1 00

Pies.

Apple pie.

1st Prem., Mrs. A. A. White	$2 00
2nd Prem., Mrs. A. LeFeber, West Allis, Wis	1 00

Mince pie.

1st Prem., Mrs. A. LeFeber	$2 00
2nd Prem., Alice I. Clapp	1 00

Pumpkin pie.

1st Prem., Mrs. A. LeFeber	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Miscellaneous.

Raised doughnuts.

1st Prem., Mrs. L. Yanke	$2 00
2nd Prem., Mrs. A. A. White	1 00

Baking powder doughnuts.

1st Prem., Mrs. W. W. Paine	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Crullers.

No first.

2nd Prem., Mrs. Christian G. Lee	$1 00

Tarts.

1st Prem., Edna Stoppenbach	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Baked beans.

1st Prem., Mrs. F. F. Rika, Milwaukee, Wis	$2 00
2nd Prem., Mrs. E. M. Douville	1 00

Homemade candy.

1st Prem., Mrs. Giles Hibbard	$3 00
2nd Prem., Mary Pitzka	2 00

Canned Fruit.

Peaches—plain syrup.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Peaches—brandied.

1st Prem., Mrs. R. Wendland	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Native plums.

1st Prem., Bertha Puerner, Jefferson, Wis	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Green gages.

1st Prem., Mrs. J. Jahnke, Milwaukee, Wis	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Currants.

1st Prem., Mary Hart	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Grapes.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Pears.

1st Prem., Mrs. J. Jahnke	$2 00
2nd Prem., Lizzie Mayer, Wauwatosa, Wis	1 00

Cherries.

1st Prem., Alma A. Wolf	$2 00
2nd Prem., Mrs. E. S. Sinsel, Waukesha, Wis	1 00

Pineapples.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Tomatoes.

1st Prem., Mrs. F. C. Elliott, Waukesha, Wis	$2 00
2nd Prem., Lizzie Mayer	1 00

Gooseberries.

1st Prem., Ella M. Goelzer, Oakwood, Wis	$2 00
2nd Prem., Mrs. W. W. Paine	1 00

Strawberries.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Mrs. John Hans	1 00

Blackberries.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Lizzie Mayer	1 00

Red raspberries.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Ella M. Goelzer	1 00

Black raspberries.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mrs. F. C. Elliott	1 00

Jelly.

Crab apple.

1st Prem., Alice I. Clapp	$2 00
2nd Prem., Alice I. Clapp	1 00

Native plum.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mrs. F. C. Elliott	1 00

Currant.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., M. Riordan	1 00

Grape.

1st Prem., Mrs. F. C. Elliott	$2 00
2nd Prem., Mrs. L. Yanke	1 00

Quince.

1st Prem., Alma Bigelaar	$2 00
2nd Prem., Mrs. L. Yanke	1 00

Red raspberry.

1st Prem., Mrs. W. P. Wegner	$2 00

Jam.

Strawberry.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Raspberry.

1st Prem., Lizzie Mayer	$2 00
2nd Prem., Mrs. E. S. Sinsel	1 00

Blackberry.

1st Prem., Mary Hart	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Gooseberry.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mary Hart	1 00

Native plum.

1st Prem., Bertha Puerner	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Peach.

1st Prem., Bertha Puerner	$2 00
2nd Prem., Mary Hart	1 00

Apple butter.

1st Prem., Mrs. John Hans	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Preserved tomatoes.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mary Hart	1 00

Orange marmalade.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., M. Riordan	1 00

Pickles.

Peach.

1st Prem., Mary Hart	$2 00
2nd Prem., Mrs. W. P. Wegner	1 00

Pear.

1st Prem., Bertha Puerner	$2 00
2nd Prem., Mary Hart	1 00

Sweet apple.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mrs. John Hans	1 00

Crab apple.

1st Prem., Mrs. L. Yanke	$2 00
2nd Prem., Mrs. John Hans	1 00

Spiced currants.

1st Prem., Mrs. John Hans	$2 00
2nd Prem., Mary Hart	1 00

Cucumber, ripe, sweet.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Mrs. John Hans	1 00

Cucumbers, in olive oil.

1st Prem., Carrie J. Smith	$2 00
2nd Prem., Mrs. A. LeFeber	1 00

Dill pickles.

1st Prem., Mrs. F. C. Elliott	$2 00
2nd Prem., Mrs. Frank Granger	1 00

Sour pickles.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Mrs. F. C. Elliott	1 00

Pickled cauliflower.

1st Prem., Mrs. F. C. Elliott	$2 00
2nd Prem., Mrs. S. W. Poppe	1 00

Pickled peppers.

1st Prem., Mrs. F. C. Elliott	$2 00

Onion pickles.

1st Prem., Mrs. Frank Granger	$2 00
2nd Prem., Lizzie Mayer	1 00

Mustard pickles.

1st Prem., Mrs. F. C. Elliott	$2 00
2nd Prem., Bertha Puerner	1 00

Mixed pickles.

1st Prem., Mrs. S. W. Poppe	$2 00
2nd Prem., Bertha Puerner	1 00

Chili sauce, bottle.

1st Prem., Mrs. L. Yanke	$2 00
2nd Prem., Alma Bigelaar	1 00

Catsup, bottle.

1st Prem., Mrs. W. P. Wegner	$2 00
2nd Prem., Mrs. F. C. Elliott	1 00

EDUCATIONAL DEPARTMENT.

Judge.

President Charles McKenny, Milwaukee, Wis.

OPEN TO ALL SCHOOLS.

Best production map of America.

No first.

No second.

3rd Prem., Pearl Claridge, Reedsburg, Wis	$1 00

Historical map of United States.

1st Prem., Lulu Powe [illegible] edsburg, Wis	$3 00
2nd Prem., Urvin Ke [illegible] ecil, Wis	2 00
3rd Prem., Walter Kam[illegible]man, Cecil, Wis	1 00

Best map of any continent.

1st Prem., Arthur Fish, Reedsburg, Wis	$3 00
2nd Prem., Christina Schwartz, Plain, Wis	2 00
3rd Prem., Ruby Greatsinger, Evansville, Wis	1 00

Collection Wisconsin woods.

1st Prem., Clarence Claridge, Reedsburg, Wis	$4 00
2nd Prem., Thomas Claridge, Reedsburg, Wis	3 00
3rd Prem., George Drbal, Milwaukee, Wis	2 00

Collection noxious weeds.

1st Prem., Carrie Lawrenz, Reedsburg, Wis	$3 00

Collection Wisconsin wild flowers.

1st Prem., Edith Schoenman, Plain, Wis	$3 00
2nd Prem., Carrie Lawrenz	2 00

Exhibit Wisconsin grasses.

No first.	
2nd Prem., Clarence Claridge	$2 00

Photograph, school grounds.

1st Prem., Annie Doerfler, Milwaukee, Wis	$3 00

Piece of wood work.

1st Prem., Henry Risley, Baraboo, Wis	$3 00
2nd Prem., William Bland, Milwaukee, Wis	2 00
3rd Prem., Walter Moehrig, Milwaukee, Wis	1 00

Drawing of fruit.

1st Prem., Armin Hanson, Milwaukee, Wis	$2 00
No second.	
3rd Prem., Nellie Murphy, Beloit, Wis	1 00

Drawing of flowers.

1st Prem., Mabel Russell, teacher, Jefferson, Wis	$2 00
2nd Prem., Essie Berry, Baraboo, Wis	1 50
3rd Prem., Esther Blackburn, Beloit, Wis	1 00

Work in flowers, in colors.

1st Prem., East Division High School, Milwaukee, Wis	$2 00
2nd Prem., Alma Koeppen, Cecil, Wis	1 50
3rd Prem., Anita Downey, Whitewater, Wis	1 00

Work in fruit, in colors.

1st Prem., Mabel Russell, teacher	$2 00
2nd Prem., Eunice Pearson, Baraboo, Wis	1 50
3rd Prem., Grace Gould, Lima Center, Wis	1 00

Best pose drawing.

1st Prem., East Division High School	$2 00
2nd Prem., East Division High School	1 50
3rd Prem., Mabel Russell, teacher	1 00

Best wall paper design.

1st Prem., East Division High School	$2 00
2nd Prem., Armin Hanson	1 50
3rd Prem., Mabel Russell, teacher	1 00

Book cover design.

1st Prem., Terence Weber, Milwaukee, Wis	$2 00
2nd Prem., Elizabeth Schroeder, Milwaukee, Wis	1 50
3rd Prem., Gertrude Gram, Milwaukee, Wis	1 00

Sketch of school house.

No first.	
No second.	
3rd Prem., Essie Berry	1 00

Illustrated poem or story.

1st Prem., Rena Smith, Two Rivers, Wis	$2 00
2nd Prem., Edna Anderson, Two Rivers, Wis.))Tied ($1.25 each)	2 50
3rd Prem., Kate Smith, Two Rivers, Wis.)	

Home work by boys.

1st Prem., Harold Haskell, Milwaukee, Wis	$2 00
2nd Prem., Howard Van Eweyk, Milwaukee, Wis	1 50
3rd Prem., Clarence Claridge	1 00

Home work by girls.

1st Prem., Alma Brown, Milwaukee, Wis	$2 00
2nd Prem., Harriet Holman, Greenfield, Wis	1 50
3rd Prem., Olive Glassner, Milwaukee, Wis	1 00

Pictures illustrating any industry.

No first.	
2nd Prem., Thomas Claridge, Reedsburg, Wis	$1 50

Drawing in pencil or charcoal.

1st Prem., Edwin Freundt, Milwaukee, Wis	$2 00
2nd Prem., Lucy McCarthy, Reedsburg, Wis	1 50
3rd Prem., Mabel Russell, teacher	1 00

Note book on school subject.

1st Prem., Juliet Hahn, West Allis, Wis	$2 00
No second.	
3rd Prem., Edith Schoenman	1 00

Best outline of book read during year.

1st Prem., Marie LeFeber, West Allis, Wis	$2 00
2nd Prem., Gertrude McCullem, West Allis, Wis	1 50
3rd Prem., Juliet Hahn	1 00

Commencement oration or essay.

No first.	
2nd Prem., Irwin Wagner, Readstown, Wis	$1 50
No third.	

GRADED SCHOOLS.

Sub-Primary.

Example free-hand cutting.

1st Prem., Bessie Fuller, Fort Atkinson, Wis	$2 00
2nd Prem., Lincoln School, West Allis, Wis	1 50
3rd Prem., Professor W. P. Roseman, Watertown Schools	1 00

Example illustrative drawing.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Professor W. P. Roseman	1 00

Example color work.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Sarah McIntyre, Fort Atkinson, Wis	1 00

First Grade

Example free-hand cutting.

1st Prem., Garfield School, West Allis, Wis	$2 00
2nd Prem., Sarah McIntyre	1 50
3rd Prem., Bessie Fuller, Fort Atkinson, Wis	1 00

Example mat weaving.

1st Prem., Washington School, West Allis, Wis	$2 00
2nd Prem., Fred Kinney, La Valle, Wis	1 50
3rd Prem., Carl Bowers, Lima Center, Wis	1 00

Specimen of pasting.

1st Prem., Henry Gould, Lima Center, Wis	$2 00
2nd Prem., Eva Conry, Lima Center, Wis	1 50
3rd Prem., Carl Bowers	1 00

Specimen of paper folding.

No first.	
2nd Prem., Garfield School	$1 50
No third.	

Specimen of sewing.

1st Prem., Stella Courtier, La Valle, Wis	$2 00
No second.	
No third.	

Representation of Esquimaux life.

1st Prem., 9th District No. 2, Milwaukee, Wis	$2 00
2nd Prem., Bessie Fuller	1 50
3rd Prem., Sarah McIntyre	1 00

Collection of drawing work.

1st Prem., Mabel Russell, teacher	$2 00
2nd Prem., Bessie Fuller	1 50
3rd Prem., Lincoln school	1 00

Second Grade.

Example of free-hand cutting.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Lincoln School	1 50
3rd Prem., Hattie Ward, teacher, Fort Atkinson, Wis	1 00

Example mat weaving.

1st Prem., Stanley Briggs, La Valle, Wis	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Daniel McComb, Lima Center, Wis	1 00

Example color work.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Hattie Ward	1 50
3rd Prem., Lincoln School	1 00

Specimen vertical writing.

1st Prem., Joe Liston, Milwaukee, Wis	$2 00
2nd Prem., Cecil Mark, Milwaukee, Wis	1 50
3rd Prem., Irene Engler, Milwaukee, Wis	1 00

Specimen sewing.

1st Prem., Edith McCarthy, Milwaukee, Wis	$2 00
2nd Prem., Carol Davidson, La Valle, Wis	1 50

Illustrated work of Hiawatha.

No first.	
2nd Prem., Professor W. P. Roseman	$1 50
3rd Prem., Perle Hendershot, Fort Atkinson, Wis	1 00

Third Grade.

Sheet skeleton action drawing.

1st Prem., Lincoln School	$2 00
2nd Prem., Mabel Russell, teacher	1 50
No third.	

Drawing of plant or animal life.

1st Prem., Adele Webb, teacher, Fort Atkinson, Wis	$2 00
2nd Prem., Clara Coutremarsh, teacher, Fort Atkinson, Wis	1 50
3rd Prem., Hattie Ward, teacher	1 00

Specimen slanting writing.

1st Prem., Ida Dulde, West Allis, Wis	$2 00
2nd Prem., Anna Doyle, West Allis, Wis	1 50
No third.	

Specimen vertical writing.

No first.	
2nd Prem., Iva Schwartz, La Valle, Wis	$1 50
No third.	

Specimen raffia work.

1st Prem., Frederick Wegner, Milwaukee, Wis	$2 00
2nd Prem., Eber Pugh, Ironton, Wis	1 50
3rd Prem., Roy Loeffler, Milwaukee, Wis	1 00

Illustration of any word picture.

1st Prem., Adele Webb, teacher	$2 00
2nd Prem., Clara Coutremarsh, teacher	1 50
3rd Prem., Professor W. P. Roseman	1 00

Twelve pose drawings by class.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Adele Webb, teacher	1 50

Twelve water colors by class.

1st Prem., Clara Coutremarsh, teacher	$2 00
2nd Prem., Adele Webb, teacher	1 50
3rd Prem., Professor W. P. Roseman	1 00

Example illustrative work.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Professor W. P. Roseman	1 00

Article made from any material.

1st Prem., Frederick Wegner	$2 00
2nd Prem., Grace Horne, Milwaukee, Wis	1 50
3rd Prem., Margaret Kielblock, Milwaukee, Wis	1 00

Collection of class work.

1st Prem., Mabel Russell, teacher	$2 00
2nd Prem., Adele Webb, teacher	1 50

No third.

Fourth Grade.

Specimen vertical writing.

1st Prem., May Donohue, Doylestown, Wis	$2 00
2nd Prem., Ida Gehrke, Lima Center, Wis	1 50

No third.

Specimen slanting writing.

1st Prem., David Conrad, West Allis, Wis	$2 00
2nd Prem., Elsie Albers, West Allis, Wis	1 50
3rd Prem., Evelyn Guhr, West Allis, Wis	1 00

Sheet skeleton action drawing.

1st Prem., Mabel Russell, teacher	$2 00
No second.	
No third.	

Drawing of plant or animal life.

1st Prem., Mabel Russell, teacher	$2 00
2nd Prem., George Waldman, Lima Center, Wis	1 50
No third.	

Illustrative work.

1st Prem., Jessie Marr, teacher	$2 00
2nd Prem., Mabel Russell, teacher	1 50
3rd Prem., Professor W. P. Roseman	1 00

Drawings in pencil or charcoal.

1st Prem., Jessie Marr, teacher	$2 00
2nd Prem., Mabel Russell, teacher	1 50
No third.	

Set of water colors.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Jessie Marr, teacher	1 00
3rd Prem., Professor W. P. Roseman	1 00

Specimen of raffia work.

1st Prem., Alva Butter, Milwaukee, Wis	$2 00
2nd Prem., Frederick Rietbrock, Milwaukee, Wis	1 50
3rd Prem., Edna Rilling, Milwaukee, Wis	1 00

Specimen community or class work.

1st Prem., Mabel Russell, teacher	$2 00
2nd Prem., 4th District, Milwaukee, Wis	1 50
No third.	

Fifth Grade.

Specimen vertical writing.

1st Prem., Edna Daniels, Milwaukee, Wis	$2 00
2nd Prem., Lulu Titus	1 50
3rd Prem., Gertrude Doyle, West Allis, Wis	1 00

Specimen slanting writing.

No first.	
2nd Prem., Lillian Procknow, West Allis, Wis	$1 50
No third.	

Objects in card board.

1st Prem., Gertrude Foote, teacher, Fort Atkinson, Wis	$2 00
No second.	
No third.	

Drawing in pencil or charcoal.

1st Prem., Gertrude Foote, teacher	$2 00
2nd Prem., Florence Main, teacher, Fort Atkinson, Wis	1 50
3rd Prem., Professor W. P. Roseman	1 00

Illustrated poem or story.

1st Prem., Beatrice Siekert, West Allis, Wis	$2 00
2nd Prem., Gertrude Doyle, West Allis, Wis	1 50
3rd Prem., Otto Conrad, West Allis, Wis	1 00

Example illustrative work.

1st Prem., 8th District, No. 8, Milwaukee, Wis	$2 00
2nd Prem., Washington School, West Allis, Wis	1 50
No third.	

Collection of written work.

1st Prem., Flora Mueller, Milwaukee, Wis	$2 00
2nd Prem., Louise Wechselberg, Milwaukee, Wis	1 50
No third.	

Collection of community or class work.

1st Prem., 8th District, No. 2, Milwaukee, Wis	$2 00
2nd Prem., 9th District, No. 1, Milwaukee, Wis	1 50
3rd Prem., Arthur Orloff, Milwaukee, Wis	1 00

Set of pose drawings.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Gertrude Foote, teacher	1 00

Sixth Grade.

Set of copy books.

1st Prem., 8th District, No. 3, Milwaukee, Wis	$2 00
No second.	
No third.	

Specimen vertical writing.

1st Prem., Myrtle Eichelberg, Milwaukee, Wis	$2 00
2nd Prem., Esther Koepke, Milwaukee, Wis	1 50
3rd Prem., Celia Mosher, Milwaukee, Wis	1 00

Drawing showing development of seed.

No first.	
2nd Prem., George Bloor, West Allis, Wis	$1 50
No third.	

Set of pose drawings.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Mary Spry, teacher, Fort Atkinson, Wis	1 50
3rd Prem., Professor W. P. Roseman	1 00

Example of constructive work.

1st Prem., Ruth Pfister, Milwaukee, Wis	$2 00
2nd Prem., Mathilda Mohr, Milwaukee, Wis	1 50
3rd Prem., Flora Kesselhut, Milwaukee, Wis	1 00

Seventh Grade.

Mass drawing of a tree.

1st Prem., Elizabeth Schroeder, Milwaukee, Wis	$2 00
No second.	
3rd Prem., Mabel Russell, teacher	1 00

Skeleton drawing of a tree.

No first.	
No second.	
3rd Prem., Eunice Pearson	$1 00

Specimen penmanship.

1st Prem.. Viola Weber, Milwaukee, Wis	$2 00
2nd Prem., Isadore Muskat, Milwaukee, Wis	1 50
3rd Prem., Amelia Reese, Baraboo, Wis	1 00

Political map of any foreign country.

No first.	
No second.	
3rd Prem., Eunice Pearson	$1 00

Collection of constructive work.

No first.	
2nd Prem., Mabel Russell, teacher	$1 50
No third.	

Best constructed article.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
No third.	

Cover design, flowered.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Bessie Kellogg, teacher, Fort Atkinson, Wis	1 50
3rd Prem., Armin Hanson	1 00

Eighth Grade.

Set of historical maps.

No first.	
2nd Prem., Maggie Masters, teacher, Fort Atkinson, Wis	$1 50
3rd Prem., Maggie Masters, teacher	1 00

Composition or story.

1st Prem., Martha Gray, Milwaukee, Wis	$2 00
2nd Prem., Lydia Dankworth, Milwaukee, Wis	1 50
3rd Prem., Fannie Gettelman, Milwaukee, Wis	1 00

Relief map of any continent.

1st Prem., Assumption School. West Allis. Wis	$2 00
2nd Prem., Assumption School	1 50
No third.	

Drawing of human heart, ear, and eye.

1st Prem., William Samp, Cecil, Wis	$2 00
2nd Prem., Leta Tyrell, Cecil, Wis	1 50
3rd Prem., Walter Kammerman, Cecil, Wis	1 00

Set of examination papers.

1st Prem., Max Davidson, Janesville, Wis	$2 00
2nd Prem., Daisy Dean, Janesville, Wis	1 50

No third.

Ground plan of a house.

1st Prem., Maggie Masters, teacher	$2 00
2nd Prem., Maggie Masters, teacher	1 50

No third.

Set of studies, pencil, charcoal, or crayon.

1st Prem., Maggie Masters, teacher	$2 00
2nd Prem., Maggie Masters, teacher	1 50
3rd Prem., Professor W. P. Roseman	1 00

Exercise in original design.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Lincoln School	1 50
3rd Prem., Mabel Russell, teacher	1 00

Set of pose drawings.

1st Prem., Professor W. P. Roseman	$2 00
2nd Prem., Professor W. P. Roseman	1 50
3rd Prem., Professor W. P. Roseman	1 00

Best constructed article by individual.

1st Prem., Maggie Masters, teacher	$2 00

No second.

No third.

HIGH SCHOOLS.

Set of drawings in physiology, physics or botany.

1st Prem., East Division High School, Milwaukee, Wis	$2 00
2nd Prem., East Division High School	1 50
3rd Prem., East Division High School	1 00

Example mechanical drawing.

1st Prem., East Division High School	$2 00
No second.	
No third.	

Note book on any subject.

1st Prem., Sophia Rust, West Allis, Wis	$2 00
2nd Prem., Lottie Bell, West Allis, Wis	1 50
3rd Prem., Kate Smith	1 00

Example color work.

1st Prem., East Division High School	$2 00
No second.	
No third.	

RURAL SCHOOLS.

Specimen vertical writing.

No first.	
No second.	
3rd Prem., Margaret Lathers, Beloit, Wis	$1 00

Specimen slanting writing.

No first.	
No second.	
3rd Prem., Josephine Meyer, teacher, Oakwood, Wis	$1 00

Drawing of plant life.

No first.	
No second.	
3rd Prem., Lawrence Kuhn, Evansville, Wis	$1 00

Drawing of animal life.

No first.	
No second.	
3rd Prem., Lawrence Kuhn	$1 00

Specimen color work.

1st Prem., Albert Claridge, Reedsburg, Wis	$2 00
No second.	
No third.	

Specimen paper folding.

1st Prem., Albert Claridge	$2 00
2nd Prem., Harold Koerner, Janesville, Wis	1 50
No third.	

Example of nature work.

No first.	
2nd Prem., Turtle School, Beloit, Wis	$1 50
No third.	

Example of hand work.

1st Prem., Edna Hoh, Greenville, Wis	$2 00
No second.	
3rd Prem., Leonard Schoenman, Plain, Wis	1 00

Middle Form.

Sample vertical writing.

1st Prem., Harriet Maylard, Evansville, Wis	$2 00
No second.	
3rd Prem., Esther Milbrandt, Evansville, Wis	1 00

Sample slanting writing.

No first.	
No second.	
3rd Prem., Josephine Meyer, teacher	$1 00

Object drawing in outline.

No first.	
No second.	
3rd Prem., Esther Milbrandt	$1 00

Illustrated poem or story.

1st Prem., Esther Milbrandt	$2 00
2nd Prem., Wilfred Maylard	1 50
No third.	

Outline map of North America.

1st Prem., Silas Nachreiner, Plain, Wis	$2 00
2nd Prem., Arthur Milbrandt	1 50
3rd Prem., Wilfred Maylard	1 00

Drawing in color.

1st Prem., Esther Milbrandt	$2 00
2nd Prem., Harriet Maylard	1 50
3rd Prem., Esther Blackmer, Beloit, Wis	1 00

Drawing book.

1st Prem., Wilfred Maylard	$2 00
2nd Prem., Harriet Maylard	1 50
3rd Prem., Esther Milbrandt	1 00

Letter to a friend.

1st Prem., Harriet Maylard	$2 00
2nd Prem., Wilfred Maylard	1 50
3rd Prem., Arthur Milbrandt	1 00

Drawing in pencil or charcoal.

1st Prem., Esther Lathers	$2 00
2nd Prem., Esther Milbrandt	1 50
3rd Prem., Harriet Maylard	1 00

Example of hand work.

1st Prem., Clara Olsen, teacher, Scandinavia, Wis	$2 00
2nd Prem., Minnie Lanthold, teacher, St. Lawrence, Wis	1 50
3rd Prem., Thomas Claridge, Reedsburg, Wis	1 00

Upper Form.

Specimen penmanship.

1st Prem., Anna Paulson, Plain, Wis	$2 00
2nd Prem., Sarah Crane, Janesville, Wis	1 50
3rd Prem., Bessie Brewer, Boyceville, Wis	1 00

Best business letter.

1st Prem., Emma Mrskosh, Two Rivers, Wis	$2 00
2nd Prem., Christina Brei, Plain, Wis	1 50
3rd Prem., Pearl Claridge, Reedsburg, Wis	1 00

Map of any continent.

1st Prem., Grace Brecht, Plain, Wis	$2 00
2nd Prem., Grace Thering, Plain, Wis	1 50
3rd Prem., Gisella Haas, Plain, Wis	1 00

Collection of noxious weeds.

No first.	
2nd Prem., Clarence Claridge, Reedsburg, Wis	$1 50
No third.	

Best physiology drawing.

1st Prem., Paul Claridge	$2 00
2nd Prem., Gisella Haas	1 50
3rd Prem., Christina Schwartz, Plain, Wis	1 00

Collection of wild flowers.

1st Prem., Mary Ledvina, Kellnersville, Wis	$2 00
2nd Prem., Ruth Sparks, Reedsburg, Wis	1 50
3rd Prem., Pearl Claridge	1 00

Best piece of sewing.

No first.	
2nd Prem., Pearl Claridge	$1 50
No third.	

Best relief map of Wisconsin.

No first.	
2nd Prem., Christina Schwartz	$1 50
3rd Prem., Edna Smith, Baraboo, Wis	1 00

Social letter.

1st Prem., Carrie Hutterm, Plain, Wis	$2 00
2nd Prem., Ruby Greatsinger, Evansville, Wis	1 50
3rd Prem., Minne Milbrandt	1 00

Drawing book.

1st Prem., Lee Milbrandt, Evansville, Wis	$2 00
2nd Prem., Ruby Greatsinger	1 50
3rd Prem., Minnie Milbrandt	1 00

Essay on gardening.

1st Prem., Pearl Claridge	$2 00
No second.	
No third.	

Set of examination papers.

No first.	
2nd Prem., Bessie Brewer, Boyceville, Wis	$1 50
No third.	

Exhibit of corn grown under the direction of teacher.

1st Prem., Lloyd Hackett, North Freedom, Wis	$2 50
No second.	
No third.	

SUMMARY OF RACES.

Starting Judge.
F. E. Stone, Burlington, Wis.

TROTTING.

2:06 Trot. Purse, $1,500.

Early Alice, b. m., W. B. Taylor, Sedalia, Mo	2—1—1—1
Watson, ch. g., Geo. C. Loomis, Minneapolis, Minn	1—3—2—2
Belfast, b. g., T. E. Root, Rockford, Ill	3—2—3—3

Time 2:06¼. 2:09. 2:09½.

2:10 Trot. Purse, $1,500.

Baraja, b. g., J. J. Shaw, Chicago, Ill	1—1—1
Dixon, s. h., W. C. Allen, Moline, Ill	2—3—2
Just the Thing, br. m., J. R. Patton, Atlanta, Ill	3—2—3
Icelander, b. m., Riverside Stock Farm, Berlin, Wis	4—Dis.

Time 2:12½. 2:12. 2:12.

2:14 Trot. Purse, $2,000.

Brace Girdle, b. m., Dick McMahon, Chicago, Ill	5—1—1—1
Black Silk, blk. m., Chas. Jennings, Ponca City, Okla	1—6—3—3
Red Cross, b. g., Geo. C. Loomis, Minneapolis, Minn	3—2—2—2
Glazier B, blk. h., J. S. Conway, Streator, Ill	2—3—4—4
Gratitude, b. g., T. B. Loudon, Libertyville, Ill	6—4—5
Quintell, b. s., H. H. James, Winnipeg, Man	4—5—Dr.
Jewel Rex, b. s., Mondovi S. H. B. Assoc., Mondovi, Wis	Dis.

Time 2:11½. 2:11. 2:11. 2:13½.

2:18 Trot. Purse, $1,000.

Golden Rule, ch. h., Peter Reul, De Pere, Wis	1—1—1
Charley Russell, br. h., Riverside Park Farm, Berlin, Wis	2—3—3
Horace G, g. g., MacDermid, Colorado Springs, Col	4—4—3
Emma Grattan, b. m., L. O. Turner, Libertyville, Ill	3—2—Dis.
Creswick Jr., b. g., . S. Conway, Streator, Ill	Dis.

Time 2:15¼. 2:16¼. 2:16¼.

2:20 Trot. Purse, $5,000.

Fleming Boy, b. s., P. C. Isaacs, Stayestown, Pa	1—2—1—1
The Zoo, br. h., A. E. Wilson, Killarney, Man	2—1—3—2
Axcelene, b. m., S. S. Smith, Baraboo, Wis	4—4—2—4
O. K. Stengall, gr. g., S. H. Newman, Algoma, Wis	3—3—4—3
Milham, b. g., Frank A. Milham, Kalamazoo, Mich	6—Dis.

Time 2:07¾. 2:09. 2:12¾. 2:11.

2:30 Trot: Purse, $1,000.

May Kennedy, br. m., L. Lindauer, Kaukauna, Wis	1—1—1
Isabelle, b. m., G. Ives & Sons, New Boston, Ill	3—2—2
Warrenwood, ch. s., Geo. Wilkinson, Ashland, Wis	2—3—Dis.

Time 2:16¼. 2:16¼. 2:15¼.

3 year old Trot. Purse, $500.

Sub Rosa, b. f., Riverside Park Farm, Berlin, Wis	1—1
Castle Dome, b. c., J. B. Chandler, Berlin, Wis	2—2
Peter Preston, g. c., Sol Lachlos, Monmouth, Ill	3—3

Time 2:10¼. 2:16¼.

TROTTING HANDICAP.

Purse, $2,000.

Dexter M, b. g., Theo Sterneman, Milwaukee, Wis	1
Baraja, b. g., J. J. Shaw, Chicago, Ill	2
Bernolga, ro. g., F. S. Whitney, Macon, Ga	3
Brace Girdle, b. m., Dick McMahon, Libertyville, Ill	4
Golden Rule, ch. h., Peter Reul, De Pere, Wis	5
Charley Russell, br. h., Riverside Park Farm, Berlin, Wis	6
Belle G, ch. m., R. Gumz, Milwaukee, Wis	7
Yankee Boy, blk. g., J. W. Flack, Milwaukee, Wis	8
Horace G, g. g., K. MacDermid, Colorado Springs, Col	9

PACING.

2:04 Pace. Purse, $1,500.

Citation, b. m., Dick McMahon, Chicago, Ill	1—1—1
Robert Lee, blk. g., A. E. Wilson, Killarney, Man	2—2—2
Oakly D, g. h., Theo Sterneman, Milwaukee, Wis	3—3—3

Time 2:05. 2:05. 2:06¼.

2:09 Pace. Purse, $1,500.

Red Bow, b. m., Dick McMahon, Chicago, Ill	1—2—1—1
Spill, b. h., W. B Taylor, Sedalia, Mo	2—1—2—2
Hal Raven, b. m., John L. Wentz, Scranton, Pa	3—3—4—3
Robert Kernan, b. g., Frank H. Milham, Kalamazoo, Mich.	4—4—3—4
Rex, ro. g., E. T. Gumz, Milwaukee, Wis	Dis.

Time 2:05½. 2:08. 2:06½. 2:09.

2:13 Pace. Purse, $5,000.

Jerry B, ch. g., Christian Hill Stables, Manchester, N. H.	1—1—1
Isinita, b. m., Geo. C. Loomis, Minneapolis, Minn	2—2—2
Gov. Sarles, b. h., Geo. W. Newton, Williston, N. Dak	3—3—3
Hal Raven, b. m., John L. Wentz, Scranton, Pa	4—4—5
Nilmah, b. m., W. H. Anderson, Kirkland, Ill	7—5—4
Woodford B., b. s., W. B. Taylor, Sedalia, Mo	6—6—Dr.
Dick White, ch. g., L. Lindauer, Kaukauna, Wis	5—Dis.

Time 2:04¼. 2:05. 2:04½.

2:16 Pace. Purse, $1,000.

Count Buckner, br. h., D. J. Fenelon, Ripon, Wis	1—1—1
Gen. Luther, b. s., Gus Paseman, Appleton, Wis	2—2—2
Chas. Howe, b. g., Dick McMahon, Chicago, Ill	4—3—3
Baby Afrite, blk. g., James Briquelet, De Pere, Wis	3—4—4
Lula Dumas, br. m., John R. Powers, Peoria, Ill	Dis.

Time 2:06¾. 2:07¼. 2:08¾.

2:19 Pace. Purse, $1,000.

Hazel Simmons, ch. m., I. L. Sears, Davenport, Ia	1—1—1
Marjery Wilkes, ro. m., Howard Knowlton, Volney, Ill	2—2—2
Irene Lockhart, br. m., William Hope, Green Bay, Wis	3—3—3
McMar, ro. h., R. Leak, Ambia, Ind	4—4—4
Bonnie Wilkes, b. s., Gus Paseman, Appleton, Wis	5—5—5
Ruth W, b. m., Dave Waixel, Chicago, Ill	6—Dis.
Red Game, b. h., C. R. Heaton, Princeton, Ill	Dis.

Time 2:10½. 2:07¼. 2:09.

2:22 Pace. Purse, $2,000.

Ding Pointer, b. m., Herbert Stock Farm, Denver, Colo.	2—2—1—1—1
Diamond King, blk. g., Geo. C. Loomis, Mpls., Minn.	1—1—2—2—3
Brother Will, bb. g., A. G. Hahn, Sioux Falls, S. Dak.	3—3—3—3—2
Onadanna, b. h., Rumquist & Elliott, Duluth, Minn.	Dis.

Time 2:09¼. 2:09½. 2:07¼. 2:12½. 2:11½.

2:25 Pace. Purse, $1,000.

Hazel Simmons, ch. m., I. L. Sears, Davenport, Ia	1—1—1
Meadow Brook, b. m., Riverside Park Farm, Berlin, Wis	2—3—2
Sally Conway, g. m., Dr. J. A. Ackerman, Fond du Lac, Wis	3—2—3
Redheart, Jr., ch. h., James Briquelet, De Pere, Wis	4—4—4

Time 2:12¾. 2:13¼. 2:13.

PACING HANDICAP.

Purse, $2,000.

Count Buckner, br. h., D. J. Fenelon, Ripon, Wis	1
Baby Afrite, blk. g., James Briquelet, De Pere, Wis	2
May Bird, b. m., C. J. Douglas, Kalamazoo, Mich	3
Oakly D, gr. h., Theo Sterneman, Milwaukee, Wis	4
Irene Lockhart, br. m., William Hope, Green Bay, Wis	5
Redheart Jr., br. m., James Briquelet, De Pere, Wis	6
Billy N, b. g., O. G. Hahn, Sioux Falls, S. Dak	7
Chas. Howe, b. g., Dick McMahon, Chicago, Ill	8
Irish Elder, g. g., Harry Johns, Milwaukee, Wis	9
Carrie B, br. m., Geo. King, Dallas, Tex	10

On Thursday, September 10 "Minor Heir" in a Mile Race against Time Paced same in 1:59½. Official record filed with American Trotting Association.

REPORTS OF DEPARTMENT SUPERINTENDENTS.

HORSE DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: The Horse Exhibit for the Wisconsin State Fair for the year 1908 was the largest in the history of the State. Not only were the usual horse barns full, but five additional barns formerly used for cattle were made over into horse barns, and all were well filled, making at least one-third more horses than ever before.

The awards of the judges were generally satisfactory, and the capacity of the Amphitheater proved entirely inadequate to accommodate the crowds while the stock was being judged.

A few minor changes may be necessary in the premium list for next year, but no increase in money offered is advisable at this time.

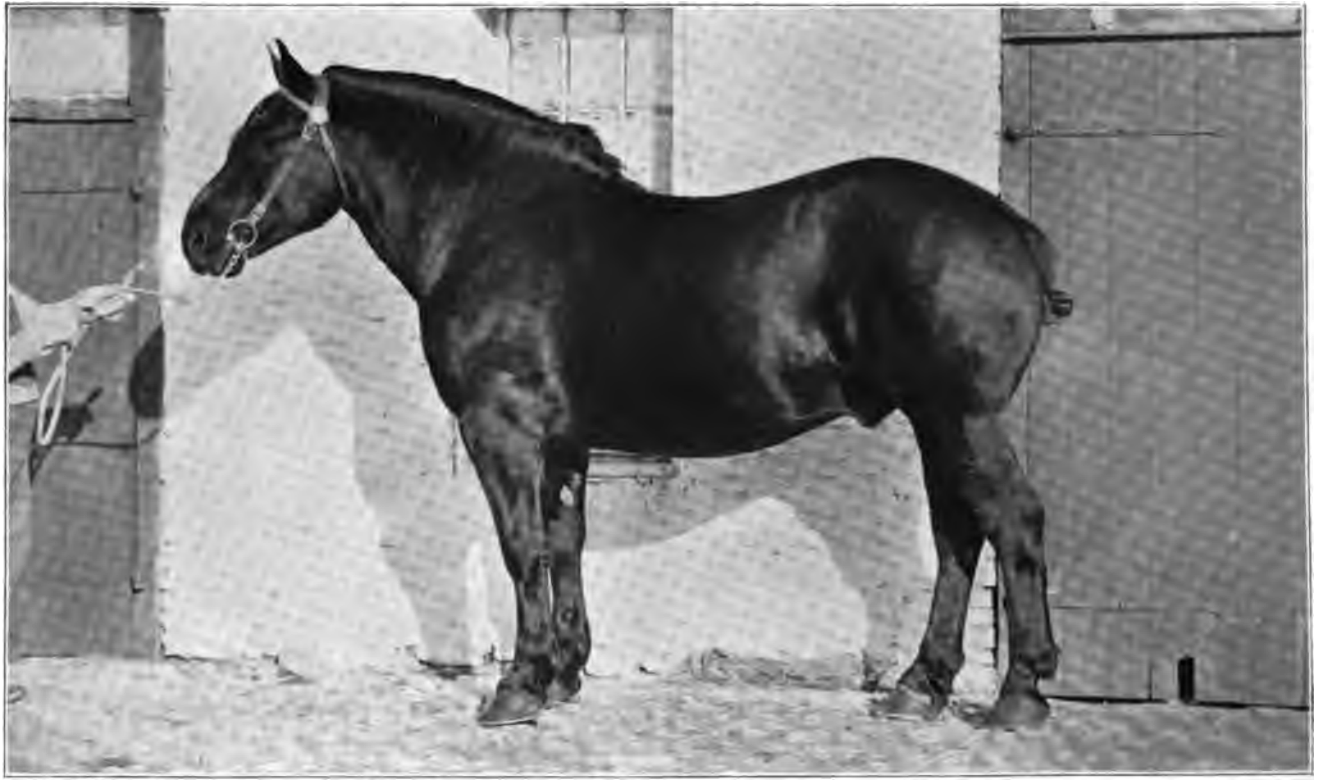
Respectfully submitted,
GEORGE WYLIE,
Superintendent.

CATTLE DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: The Superintendent of your Cattle Department would report that the show of cattle at the 1908 Wisconsin State Fair exceeded in numbers, and probably in quality, any previous exhibit.

The new cattle barn was crowded to its utmost capacity, and if it had not been for the detention, by the railroads, of two herds on their way from Nebraska State Fair, the barn would



Percheron Winner.

not have held the exhibits, and besides, this, all nurse cows were housed in one of the old cattle barns, and this too, was overcrowded.

Almost universal satisfaction was given by the judges, and the "one-judge" system, each year, proves its value. The only criticism arising, comes from the having a breeder of one kind of cattle judging other breeds.

The Superintendent would express the wish that he be allowed at least two judges in the dairy cattle department, where most of this criticism arises, and where the largest show is made.

I wish to express my appreciation of the value of the services of my assistant, Mr. J. H. Dixon of Brandon.

Respectfully submitted,
CHARLES L. HILL,
Superintendent.

SHEEP DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I beg to submit the following report of the Sheep Department of the Wisconsin State Fair for 1908.

The exhibit was very large, all the pens in the department being filled; in fact many of them were so crowded that the sheep could not be shown to the best advantage, and causing discomfort to the exhibitor.

In quality the exhibit was excellent, and I believe has never been equalled at a Wisconsin State Fair. Competition was strong in all classes except "Angora Goats." However, a mutual and friendly feeling existed throughout the contest.

There were many visitors in the Judging Pavilion while the awards were being placed, and much interest was manifested in the work. The points of excellence and general quality of the winners were also discussed with favor.

The work of the judges, Mr. Charles Kerr of St. Paul, Minn., on Fine Wool Breeds, and Mr. H. L. Compton of Kyle, Ohio, on Mutton Breeds, was very satisfactory to the exhibitors. The competency, fairness, and impartiality with which the awards were placed was most satisfactory to the exhibitors.

By way of recommendation, I would suggest that the premiums offered for "Angora Goats" be reduced one-half on first and second premiums throughout the entire class, and that the third premium be eliminated. There is no competition in this class, and I deem it not a prominent nor permanent industry in the State. I believe that the prize money taken from the "Angoras" can be better expended by being divided among the "Wisconsin Bred" sheep classes.

Respectfully submitted,
R. E. ROBERTS,
Superintendent.

SWINE DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: The exhibit of swine at our State Fair is steadily growing as shown by each succeeding Fair, both in numbers and in merit of animals shown; a large number of men showing swine with us in 1908 were making their first show at a State Fair.

The swine exhibit was larger in 1908 than in 1907 and proved entirely too large for the quarters available.

Exhibitors were largely Wisconsin men in all classes except Tamworth and Large Yorkshires. These two latter classes were filled mostly from other states. As in 1907 only one herd of Large Yorkshires was shown. Hampshires were shown for the first time at a Wisconsin State Fair. A very creditable exhibit was made by an Illinois breeder.

All classes except Tamworths were judged by Mr. N. H. Gentry, who gave general satisfaction, as did Prof. J. G. Fuller in judging the Tamworths. Your Superintendent was ably assisted by Mr. H. I. Gibson, to whom much credit is due.

Respectfully submitted,
JAMES DILLON,
Superintendent.

POULTRY AND PIGEON DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: The renovation of coops and cages with paint and aluminum added much to the attractive appearance of the

Poultry building. One week's work, by two energetic and faithful young men, served to put the department in excellent order to receive the exhibits.

Every coop and cage was thoroughly cleansed and disinfected. The old canvas which had become so weather-worn that it was unfit for use was replaced by new sheeting.

Shavings were used as a covering for the floor in the Pigeon Division and proved more satisfactory than the tan-bark that had previously been used.

On account of lack of room we were obliged to refuse space to Poultry Supply Exhibits and there was but one exhibit of this kind in the building.

The birds began to arrive on Saturday, and when the entries closed in the Pigeon Division it was found that there was a shortage of sixty cages. They were secured at once, and when the doors opened on Monday there was without question, the finest display of Poultry and Pigeons that had ever been seen at a Wisconsin State Fair.

The poultry shown was of a high order, and the quality has never been excelled in any previous exhibition. While some of the large exhibitors were missed, a large number of new ones were added to our list and out of sixty-eight entered, sixty-four carried away prizes.

The water fowl display was larger and better than ever before, and the Pet Stock—including hares of different breeds, and cavies of every variety—was a prominent part of the exhibition.

Mr. D. T. Heimlich of Jacksonville, Ill., placed the awards, and I consider his rapid, skillful work worthy of high commendation. In this division much credit is due to the able assistance of Mr. F. C. Borchert, Jr.

The Pigeon division showed the finest lot of birds that have ever been entered for competition in the State, a large number coming from Ohio and Illinois to compete with our renowned home birds. An interesting feature of the show was the flight of homers on Friday afternoon, and to which nearly every exhibitor contributed birds.

On account of our Forage Department being unable to secure old wheat for the pigeons it was found necessary to buy a higher priced food.

Mr. William Plaehn of Chicago, Ill., placed the honors with satisfaction to all, and Mr. H. Maschmeyer, who acted as assistant, made himself popular with the pigeon fanciers.

Mr. Ray Knapp of Colfax, and Mr. Floyd Ranney of Menomonie rendered valuable services in both divisions.

I would respectfully suggest that the entries in this department close three days before the opening of the Fair, in order to give time to classify and arrange the exhibit to the best advantage; that, if it is not the intention to have a new poultry house, at least fifty feet be added to the length of the old building in order to accommodate the exhibits of Poultry Supplies, and to provide ample room for the better display of feathered stock.

I would also suggest that the walk along the entire front of the building be of cement, and of uniform width with that of the Grand Stand; that a heavy wire netting be placed along the open space on the East side of the building as the canvas alone does not furnish the necessary security; that as the exhibit has grown so large a special judge be engaged for the water fowl and pet stock.

Respectfully submitted,
MRS. ADDA F. HOWIE,
Superintendent.

DEPARTMENT OF AGRICULTURE AND HORTICULTURE.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I take pleasure in presenting to you the report of the Department of Agriculture and Horticulture for the Fair of 1908. Exhibits in all classes of Agriculture and Horticulture were exceptionally strong the past season and all available space in the building was used to make the various displays. Exhibits were well arranged and made attractive as much as possible by the various exhibitors. Patrons of the Fair in passing through the building were very impressed with the showing of the many Agricultural and Horticultural products and made many favorable comments on the exhibits.

The grain and seed exhibits are on the increase each year and the display of corn was far ahead in number of exhibits and quality of the product shown, showing that good corn both in yield and quality can be produced in Wisconsin as well as in the best corn States.

In the vegetable department all classes were well filled and of high standard. The "Farmers" and "Boys" classes are especially to be commended.

The fruit exhibit was up to the standard and in some respects was better than in previous years. Instead of so many varieties being shown as in past years the fruit growers throughout the State are sifting out many varieties that are not up to standard and showing only varieties that are adapted and found profitable to grow in the State. The past season, the several entries of each variety of fruit were all placed together which aided greatly in locating and judging each variety. The coming season I would suggest that this system be used in all departments of the Agricultural and Horticultural building.

Greenhouse plants and cut flowers were in abundance and all classes in this department were well filled. The addition of new premiums on flower beds located on the grounds brought out some fine displays and did much to improve the appearance of the grounds and I would suggest liberal premiums be offered again the coming season for flower beds located on the grounds.

Exhibitors have been handicapped greatly in getting exhibits in and out of the building on account of concessions being sold abutting all around and against the Agricultural and Horticultural building and I would suggest that hereafter no concession be sold abutting on this building.

There were special exhibits made by the State Horticultural Society, the Horticultural Department of the State University, the Hunkel Seed Co., and Coe, Converse, Edwards Co., which were very neat and attractive and added much to the interior appearance of the building.

I desire to express my sincere thanks to all exhibitors and judges for the uniform kindness and consideration shown.

Respectfully submitted,

J. L. HERBST,

Superintendent.

DEPARTMENT OF FARM EXHIBITS.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: The display made in Department G. Farm Exhibits, and Bees and Honey, at the 1908 Wisconsin State Fair was very creditable as a whole, and exceptionally good in Bees and Honey. This latter display was large, very tastily arranged, and of much interest to Fair visitors. The demonstrations and lectures outside of the building, in wire cages, was very interesting and instructive, and it was viewed by large crowds of people.

The Department of Farm Exhibits was somewhat of an experiment last year. At our last Annual Meeting it was deemed best to discontinue the "County Exhibits Department" and to create a Department of "Farm Exhibits" in its place. The display was not as large as I expected, but it was good and of much general interest. I have faith in this new department and recommend its continuance.

There was no fault found, or dissatisfaction expressed in my department that I heard of. The judging was carefully done, and was, I think, satisfactory to exhibitors.

I wish to extend thanks to the State Board for courtesies and aid rendered in the management of my department.

Respectfully submitted,

C. H. EVERETT,

Superintendent.

DAIRY DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMNE: The exhibit in the Dairy Department in 1908 was again very full and complete, and very satisfactory, except that we were badly handicapped for want of sufficient room.

Some desirable exhibits of dairy utensils were excluded for lack of space, and many exhibitors who were present were extremely desirous of securing more room, and would have brought more and larger exhibits could more space have been assigned to them.

Exhibitors in this department vied with each other in the decoration of their booths, and the result was a very neat, rich, and attractive show.

Our scores on butter and cheese were slightly lower than the year previous, owing to the effect of the severe and protracted spell of dry and hot weather preceding the Fair, a cause wholly unremedial by any concerned.

Exhibitors are anxiously waiting and hoping for a new Dairy Building, and I am quite certain that with a larger and better building the exhibit would be more nearly in keeping with this greatest of interests in our Commonwealth, and we could show to the world, Wisconsin as she is—the Greatest Dairy State in the Union.

Respectfully submitted,
L. E. SCOTT,
Superintendent.

FINE ARTS DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I herewith submit to you my report of the Department of the Fine Arts during the State Fair of 1908. Every interested and reflecting visitor of the Fine Arts department notes with pleasure the development of this department from a chaotic battle ground of prize seekers to a well ordered display of truly artistic efforts. The provision that all exhibits entered must be delivered in the building by Saturday evening preceding Fair Week gives the management an opportunity to sort and place the individual exhibits in such a way that they show to the best advantage while giving, at the same time, an harmonious appearance to the arrangement as a whole. This can be said in particular of the south half of the building where the more serious efforts in painting, drawing and photographing were hung. There was an air of distinction to the principal wall of painting that would have been a credit to many a professional exhibition. The decided improvement in the exhibit of artistic photographs was particularly noticeable. Some of the partakers have the distinction of being contributors to the International Photo Salon. As there are a number of Wisconsin artists who enjoy international fame as photographers, the management will endeavor to have still better and more representative exhibitions of photographs in the coming years.

The north half of the building was devoted to the display of china painting, arts and crafts work in wood, leather, needle work, also sculpture and the lesser attempts in painting. In spite of its efforts the department has not yet been able to arouse a real interest in the newly installed arts and crafts display which is far from representative of the work done in the state. This may be partly due to the disproportioned allotting of premiums, and partly to the ignorance of the exhibitors in general as to the existence and aims of this department. The management is convinced of the usefulness and attractiveness of this department and will make a study of the reasons for its nondevelopment, and if possible will devise some means of remedy.

To the average visitor the display of china painting will seem to be on the decrease. As to quantity, this is certainly the case. By persistency on the part of the judges, the professional exhibitors who filled the greater number of our exhibition cases until a few years ago, have now practically cleared the field, and instead of the stagnation caused by the continual repetition of the same kind of work, there are signs of new and living interests which are promising for the future.

Thus it is apparent that the Art Department is striving continually to become more and more what it ought to be—to become more and more efficient in its mission to promote and stimulate the study and practice of art in all its branches in the state, and by means of well arranged exhibitions to influence the taste of the state fair visitors; thus serving an educational purpose of great consequence.

The professional prizes found practically no competitors. Desirable exhibitors for this class can hardly be expected to display their productions in the present unsafe and poorly equipped building. But the art department can promise that if once housed in appropriate quarters, it will be able to secure a display of much higher standard than is possible under present conditions, while it believes that even now our exhibitions will favorably compare with other exhibitions of a similar nature throughout the country.

Respectfully submitted,

JAMES J. NELSON,

Superintendent.

DEPARTMENT OF WOMAN'S WORK.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I hand you herewith my report of the Department of "Woman's Work" for the year 1908.

In my report for the year 1907 I said, "that in quantity and quality the showing exceeded all previous records." I am pleased to repeat the statement as to 1908. and to add that in every respect the exhibits were of still better character. A marked improvement was shown in all of the twelve classes in this Department. This was particularly so in the Division of Needle Work. Here the exhibitors were of a high grade both as to design and workmanship and embraced all branches of handiwork.

The articles placed on exhibition are manufactured in the homes of the women of Wisconsin. You will agree with me. therefore, that this department comes very near to us all, and it is gratifying to note the interest the women are taking in this department of our State Fair.

The Woman's Building is presumably visited by all women patrons of the Fair. Many see their own work in competition with that of other exhibitors. I have endeavored to make the exhibit as attractive as possible with the means at my command, but it is hardly possible to do the work in this department full justice until we have a new building. I trust you will soon be in position to provide a building suitable for the needs of the Woman's Work Department of the Wisconsin State Fair.

Respectfully submitted,
MRS. LIDA THURSTON GANNON,
Superintendent.

REPORT ON EDUCATIONAL EXHIBIT—STATE FAIR 1908.

State Board of Agriculture, Madison, Wis.,

GENTLEMEN: The exhibit in the Educational Department at the State Fair for 1908, proved a marked improvement in character and quality over that of the year previous. The number and quantity of exhibits was more than doubled. Ten counties and a score of cities sent in special exhibits, and fully a third of the school children of Wisconsin were either directly or indirectly interested in the competitions for premiums offered for displays of educational work by your Board. The City of Milwaukee schools took a deep interest in the Educational Department of the State Fair again by sending in addition to the school work in competition for premiums, a splendid display of kindergarten work, constructive work of the grades and in manual training work done in grades and high schools. West Allis furnished a very good exhibit. County superintendents, city superintendents and the teachers throughout the state are taking hold of the work connected with the Department in such a manner as to indicate that this year it will be almost necessary to use the entire building for School Exhibits. There ought to be erected a building similar to the one we have, and connected with an archway, in which the University, Normal Schools, Charitable Institutions and other State Schools might exhibit and advertise the merits of the good work they are doing, and thereby permitting the rural, village and city schools use of the entire present building for their exhibition purposes. The Educational Display always proves one of the most interesting at the State Fair.. It has a great Educational value which cannot be easily overestimated if managed and directed as it should be.

Respectfully submitted,
JOHN A. HAZELWOOD,
Superintendent.

DEPARTMENT OF WOMAN'S REST AND HOSPITAL WORK.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: In submitting to you our report of this most philanthropic of all departments, permit me first to thank our gracious "Board of Managers" for kindly accepting the suggested recommendations of last year, which resulted in a very marked improvement throughout the Cottage.

Generous hearted friends provided the necessary furnishings consisting of thirteen chairs—including seven very nice rockers—one cot, blankets, pillows, pictures, linen—in fact about everything needed.

Holton & Hunkel (Wholesale Florists) gave us, daily, an unlimited supply of roses and other choice flowers.

The stretcher borrowed from the Central Police Station we were specially requested to "forget to return."

With the improved accommodations we were enabled to entertain a larger number of patrons. The Rest Rooms were occupied nearly all the time. The check room did a nice business, despite the fact that we were not allowed to advertise it.

The more thorough equipment in Hospital branch made it possible to give excellent care in any emergency. Dr. Wright, official physician, called regularly at stated hours; also provided immediate response in case of "special call." Though the demands were not as heavy as in previous years, the services of Miss Sheprean, professional nurse, relieved your matron of a great deal of work and responsibility, thus giving the much needed time for general supervision.

The nursery was presided over by "older heads"—all good mothers experienced in the care of little ones. Ten was the largest number checked at any one time, and twenty, the largest number for one day.

The change of plumbing made it possible to keep the "pay lavatory" clean and in good order,—the worth of which can only be measured by the dollars and cents recorded, $44.70 being the receipts for "Milwaukee Day."

To say that Rest Cottage is appreciated is only to reiterate an old story. The beautiful compliments of patrons, commending reports of the daily press, and the encouraging words of President McKerrow, Secretary True, Messrs. Wylie, Cox, Hill, Nelson, and others, made glad our hearts, and aided much in making our work a success.

I would suggest that in the future all help in this department be paid in the regular way—by order of the Secretary on the State Treasurer; that receipt books be provided for the Hospital branch, also another lock cabinet for the dispensary; and that inasmuch as Rest Cottage is a Woman's Building, that the janitor's offices be dispensed with and a colored maid employed. Screens are needed for both doors and windows.

I recommend that our building be exempt from concessioners and last, but by no means least, if possible enlarge the building.

MRS. NORAH E. R. PERKINS,
Matron.

DEPARTMENT OF GROUNDS.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I herewith submit my report as superintendent of grounds for the months of August and September, 1908.

The board contracted with Mr. D. B. Danielson to do a large amount of repair work to buildings on grounds and for new cement gutter in front of Grand Stand; also city water connections, which in my opinion was a wise and valuable improvement.

The expense of this department for the fair was $842.00 paid for various purposes; $108.00 for janitor and care of toilets, $72.50 for cleaning up of garbage, $191.00 for janitor in Grand Stand and Pavilion, and the balance was for extra help in keeping grounds clean and for team work.

I enclose statement of all moneys paid out together with vouchers for same. Before leaving the grounds I saw that all buildings were properly cleaned, that the water system was drained, and a chart made of same, also correct inventory was made of all property owned by State and on Grounds, all of which is respectfully submitted..

G. U. FISHER,
Superintendent of Grounds.

MACHINERY DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: We herewith submit our report of Machinery and Vehicle Department for the Fair of 1908.

This Department was represented by about eighty car loads of vehicles and machines. Most of the machines were in operation all of the time during the Fair, and visitors who were interested in this line of industry were, we believe, satisfactorily entertained. We expect the Board will favor this department by extending the streets south, through the additional ground, also to erect a commodious vehicle and machinery shed when funds permit.

The following is a list of principal exhibitors:

Durant-Dort Carriage Co., Milwaukee—carriages.

Parry Mfg. Co., Milwaukee—carriages.

Johnson & Field Mfg. Co., Racine—fanning mills.

Beaver Dam Mfg. Co., Beaver Dam—farm implements.

Van Brunt Mfg. Co., Horicon—drills, seeders.

Dowagiac Mfg. Co., Dowagaie, Mich.—drills, seeders.

Beach Mfg. Co., Charlotte, Mich.—road culverts.

J. I. Case Threshing Machine Co., Racine—engines, threshers, steam rollers.

Appleton Mfg. Co., Batavia, Ill.—implements, feed mills, manure spreaders.

Lauson & Lawton Co., De Pere—gasoline engines.

The I. B. Rowell Co., Menomonee Falls—feed cutters, implements.

The John Lauson Mfg. Co., New Holstein—gas engines.

Smalley Mfg. Co., Manitowoc—ensilage cutters, silos.

E. Stolp & Co., Milwaukee—buggies, implements, safes.

Hall Brothers, Manitowoc—gasoline engines.

Milwaukee Hay Tool Co., Milwaukee—huskers, shredders, hay carriers.

The S. Freeman & Sons Mfg. Co., Racine—wind mills, implements.

Rosenthal Corn Husker Co., Milwaukee—huskers, shredders.

La Porte Carriage Co., La Porte, Ind.—carriages.

Racine-Sattley Co., Racine—buggies, implements.

John Dorsch, Milwaukee—gasoline engines, wagons.

Wisconsin Carriage Co., Janesville—buggies.

Staver Carriage Co., Chicago, Ill.—buggies.

Deere & Co., Moline, Ill.—implements, wagons, manure spreaders.

J. I. Case Plow Co., Racine—implements, plows, cultivators.

Wisconsin Culvert Co., Madison—road culverts.

Champion Potato Machinery Co., Hammond, Ind.—potato machinery.

Anderson Carriage Co., Anderson, Ind.—buggies.

Fuller & Johnson Mfg. Co., Madison—gasoline engines, implements.

E. W. Clark Co., Fond du Lac—buggies, implements, automobiles.

Rock Island Plow Co., Rock Island, Ill.—farm implements.

Lutter & Jacobi, Milwaukee—buggies, wagons, implements.

Fairbanks-Morse Co., Chicago, Ill.—scales, gasoline engines.

Gilson Mfg. Co., Port Washington—gasoline engines.

Western Malleable & Grey Iron Co., Milwaukee—gas engines.

Pittsburg Steel Co., Pittsburg, Pa.—woven wire fencing.

Cyclone Fence Co., Waukegan, Ill.—woven wire fencing.

Adrian Wire Fence Co., Adrian, Mich.—woven wire fencing.

Smith Mfg. Co., Chicago, Ill.—manure spreaders, litter carrier, cream separator.

Sandwich Mfg. Co., Sandwich, Ill.—hay presses, implements.

Drew Elevated Carrier Co., Waterloo—litter carriers.

Collins Plow Co., Quincy, Ill.—hay presses, implements.

Reliance Iron & Engine Co., Racine—gasoline engines, wood saws.

Brown & Sehler Co., Grand Rapids, Mich.—silos, implements

Louden Machinery Co., St. Paul, Minn.—hay tools, litter carriers.

Lindeman & Hoverson Co., Milwaukee—furnaces, stoves.

The E. W. Ross Co., Springfield, Ohio—implements.

La Crosse Plow Co., La Crosse—plows, implements.

Indiana Silo Co., Anderson, Ind.—silos.

Enterprise Mfg. Co., Columbiana, Ohio—saw mills.

Hirsch Bros. Co., Milwaukee—wagons, implements.

Anderson Vehicle Co., Fond du Lac—buggies.

Gehl Bros. Mfg., West Bend—gasoline engines.

Davenport Wagon Co., Davenport, Ia.—wagons.

The Edmondson Concrete Machine Co., South Bend, Ind.—concrete mixers.

Moline Plow Co., Moline, Ill.—buggies, implements.

Mitchell Mfg. Co., Milwaukee—litter carriers.

Dougherty Cement Post Co., Milwaukee—concrete fence posts.

Wisconsin Geological Survey, Madison—concrete road culverts.

Manlove Gate Co., Chicago, Ill.—patent gates.

Kent Mfg. Co., Fort Atkinson—cow stanchion.

R. J. Schwab & Sons Co., Milwaukee—concrete block machine.

Buffalo Pitts Co., Minneapolis, Minn.—threshing machinery.

Automatic Carrier Co., Juneau—litter carrier.

P. P. Mast & Co., Springfield, Ohio—implements.

Olson & Richardson, Stoughton—cement block machine.

M. Bundy Co., Fond du Lac—threshing machinery.

Nichols-Shepard Co., Battle Creek, Mich—threshing machinery.

The Hanson Campbell Co., Detroit, Mich.—fanning mills.

The Stover Mfg. Co., Freeport, Ill.—wind mills, feed mills.

James F. Brett, Milwaukee—grain saver attachment.

Curtis Automobile Co., Milwaukee—automobiles.

Humane Horse Collar Co., Omaha, Neb.—humane horse collars.

Stoughton Wagon Co., Stoughton—wagons.

Velie Carriage Co., Moline, Ill.—wagons, carriages.

Thomas Mfg. Co., Springfield, Ill.—drills, seeders, haying tools.

Monitor Drill Co., Minneapolis, Minn.—drills, seeders.

D. M. Sechler Co., Moline, Ill.—buggies, manure spreaders.

International Harvester Co., Milwaukee—gasoline engines, twine machines, cream separators, corn huskers, wagons, automobiles, haying tools, manure spreaders.

Janesville Machine Co., Janesville—implements.

Minneapolis Silo Co., Minneapolis, Minn.—silos.

Althouse, Wheeler & Co., Waupun—wind mills.

Power Vehicle Co., Milwaukee—automobiles.

F. W. Penny Boat Co., Milwaukee—hunting boats.

One Minute Mfg. Co., Newton, Ia.—washing machines.

Milwaukee Machinery Co., Milwaukee—gasoline engines.

Hoosier Drill Co., Richmond, Ind.—drills, seeders.

Olds Gas Power Co., Lansing, Mich.—gasoline engines.

St. Paul Ditcher & Carrier Co., St. Paul, Minn.—tile ditcher.

Russell & Co., Massillon, Ohio—threshing machinery.

The Fanmobile Co., Milwaukee—motor cycles.

Dain Mfg. Co., Ottumwa, Ia.—hay presses, implements.

Pella Stacker Co. Madison—self feeders for threshers.

Standard Iron Works, Milwaukee—gas engines.

Black Mfg. Co., Chicago, Ill.—auto-buggies.

The Grubb Humane Stanchion, Baraboo—cattle stanchion.

Oshkosh Logging Tool Co., Oshkosh—logging tools.

The William Melrose Co., Chicago, Ill.—wagon boxes.

Baker Mfg. Co., Evansville—wind mills, pumps, gas engines.

Brown-Friend Motor Co., Milwaukee—auto-buggies.

Globe Founrdy & Machine Co., Sheboygan—implements.

The Baker Mfg. Co., Chicago, Ill.—road graders.

Lenox Torrid Zone Furnace, Milwaukee—furnaces.

Trachte Bros.. & Co., Madison—water tank.

Respectfully submitted,

DAVID WEDGWOOD,

Superintendent.

FORAGE AND TRANSPORTATION DEPARTMENT
1908.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I beg leave to submit the following report:

In Forage Department, Wisconsin State Fair of 1908, bought and delivered, one hundred and thirty tons, and over, of merchandise amounting to		$1,593 00
Sold for cash, and paid over to Secretary True	$1,717 57	
Furnished the following departments—		
Horse Department	117 76	
Cattle Department	37 88	
Sheep Department	24 57	
Swine Department	24 57	
Poultry Department	27 50	
Marshal's Department	7 46	
Milwaukee Fire Department	11 20	
Light Horse Squadron, 4 days' rations	32 00	
Allie Wooster, relay race horses	34 65	
Labor in Forage Department		182 00
Net gain		259 86
		$2,034 86
	$2,034 86	

Transportation Department—		
Permits for licenses granted by Secretary True	$70 00	
Livery for department		18 00
Net gain		52 00
		$70 00
	$70 00	

Respectfully submitted,

C. T. FISHER,

Superintendent.

GRAND STAND DEPARTMENT.

To the Wisconsin State Board of Agriculture,

GENTLEMEN: I take pleasure in presenting to you the report of the Grand Stand Department, Fair of 1908. The receipts were as follows:

Monday afternoon	$686 25
Monday evening	158 75
Tuesday afternoon	706 50
Tuesday evening	251 50
Wednesday afternoon	2,621 50
Wednesday evening	772 25
Thursday afternoon	3,223 75
Thursday evening	1,436 25
Friday afternoon	822 25
Cash taken in office for box and reserved seats	36 00
Cash over and standing room in reserved seat section	26 55
	$10,741 55

Pavilion.

Monday evening	$106 00
Tuesday evening	92 75
Wednesday evening	211 75
Thursday evening	408 00
	$818 50

For which amount I hold secretary's receipts.

Expenses for help including assistant, ushers for reserved seats, boxes and Pavilion, gate keepers, turnstile men and ticket sellers amounted to $671,50, of which amount the expense for

Grand stand was	$551 50
Pavilion was	120 00
	$671 50

I am pleased to report that everything passed off in a pleasant and a satisfactory manner.

Respectfully submitted,

GEORGE G. COX.

DEPARTMENT OF GATES.

Janesville, Wis., Feb. 25, 1909.

State Board of Agriculture,

GENTLEMEN:—I would respectfully submit the following report of the Department of Gates for the year 1908:

Receipts.

	Stiles.	Team.	Total.
Monday "Labor Day" ....Sept. 7	$3,228 50	$370 25	$3,698 75
Tuesday........................Sept. 8	3,543 00	421 25	3,964 25
Wednesday ....Sept. 9	11,328 10	1,713 25	13,059 35
Thursday......................Sept. 10	16,729 50	1,922 00	18,651 50
Friday "Childrens' Day".......Sept. 11	2,497 50	350 50	2,848 00
Over run......			1.80
	$37,326 60	$4,795 25	$42,233 65

Expense of conducting the department for which vouchers have been returned.

Pay roll..	$1,111 25
Expense	34 35
Total..	$1,145 60

Monday, September 7, 1908.

Stile No.	Day.	After 5 P. M. night.	Total.
1. Passes..................................	1839	153	1992
3. " until 12 M....................	618	....	618
	2457	153	2610
1. Paid Admissions..................	$0 50	....	$0 50
2. " "	5 50	....	5 50
3. " "	61 00	....	61 00
5. " "	276 00	....	276 00
6. " "	444 00	$5 50	449 50
7. " "	770 50	6 50	777 00
8. " "	179 75	5 75	185 50
9. " "	139 00	13 25	152 25
10. " "	1,300 00	87 50	1,387 50
11. " "	32 00	....	32 00
15. " "	1 75	....	1 75
	$3,210 00	$118 50	$3,328 50

Tuesday, September 8, 1908.

Stile Number.	Day.	After 5. P. M.	Total.
1. Passes	2,066	2.84	2,350
2. " until 4 P. M	820	....	820
	2,886	284	3,170
2. Paid admissions	$0 25	....	$0 25
4. " "	....	$13 50	13 50
5. " "	442 50	21 00	463 50
6. " "	505 00	11 00	516 00
7. " "	686 50	....	686 50
8. " "	519 50	3 75	523 25
9. " "	79 50	22 25	101 75
10. " "	997 50	103 25	1,100 75
11. " "	133 00	....	133 00
15. " "	3 50	....	3 50
	$3,367 25	$174 75	$3,542 00
Add	....	....	1 00
	$3,367 25	$174 75	$3,543 00

Wednesday, September 9, 1908.

Stile No.	Day.	After 5 P. M.	Total.
1. Passes No.	3,566	....	3,566
2. "	361	....	361
3. " After 5 P. M	....	467	467
	3,927	467	4,394
Stile No.			
3. Paid admissions	$1,443 00	....	$1,443 00
4. " "	416 50	....	416 50
5. " " x 50	1,248 50	....	1,248 50
6. " "	1,734 75	$50 00	1,784 75
7. " "	459 50	....	459 50
8. " "	2,177 25	72 00	2,249 25
9. " "	252 75	....	252 75
10. " "	2,713 00	219 25	2,932 25
11. " "	374 85	....	374 85
15. " "	163 50	....	163 50
	$10,982 60	$341 25	$11,324 85
After stiles closed	....	$2 25	$2 25
Over run	$1 00	....	1 00
	$10,983 60	$343 50	$11,328 10

Thursday, September 10, 1908.

Stile No.		Day.	After 5 P. M.	Total.
1.	Passes	4,149	377	4,526
3.	"	203		203
12.	"	1,109		1,109
		5,461	377	5,838
Stile No.				
1.	Paid admissions	$ 50		$ 50
2.	" "	141 25		141 25
3.	" "	1,642 50		1,642 50
4.	" "	2,217 00		2,217 00
5.	" "	1,578 25		1,578 25
6.	" "	1,347 50	234 50	1,582 00
7.	" "	1,901 75		1,901 75
8.	" "	1,925 00	143 75	2,068 75
9.	" "	228 00	222 00	450 00
10.	" "	3,022 00	423 50	3,445 50
11.	" "	210 50		210 50
15.	" "	314 00		314 00
17.	" "	1,177 50		1,177 50
	Total	$15,705 75	$1,023 75	$16,729 50

Friday, September 11, 1908.

Stile No.		Day.	Total.
1.	Passes	2,947	
8.	Children	3,454	
9.	"	3,230	
10.	"	4,227	
12.	"	548	
		14,406	
6.	Paid admissions	1,088	1,088
7.	"	1,164 50	1,164 50
8.	"	126 50	126 50
11.	"	57 00	57 00
15.	"	61 50	61 50
		$2,497 50	$2,497 50

The turnstile system worked satisfactorily and should be continued in my judgment another year without any change. Some of the stiles, however, are beginning to show wear. One or two of them did not work satisfactorily at all times.

The issuing of Sunday checks seemed to work out quite well and the system was a great improvement over the manner of handling Sunday attendance in 1907. The same system should be adopted with any change that the conditions might have suggested.

The office building at the main gate was a great convenience and saved a great deal of time and expense.

The attendance on children's day was limited almost entirely to the school children on account of the age limit which was established by the board.

Respectfully submitted,
F. L. CLEMONS.

MARSHAL'S DEPARTMENT.

Madison, Wis., March 1, 1909.

To the Wisconsin State Board of Agriculture,

GENTLEMEN:—I beg to submit the following report of the Marshal's Department for the year 1908.

The total expense of this department was $1,591.14 paid to 62 men, 4 mounted men for the speed and live stock departments, 9 men janitors and night watches in the various buildings, 6 men night patrol work and day patrol, 28 fence guards and assistants to vaudeville. I enclose statement of all moneys paid out with vouchers for same.

My desire to preserve order and to stop the sale of intoxicating liquors, also to suppress the various kinds of gambling was accomplished. We had very little trouble with fence breakers very few complaints of articles stolen, thanks to the able assistance rendered by plain clothes men from the City of Milwaukee.

This Department can be handled with less expense by using less help on all days except Wednesday and Thursday, which I think would be advisable.

Respectfully submitted,
G. U. FISHER,
Marshal.

Jefferson, Wis., March 1, 1909.

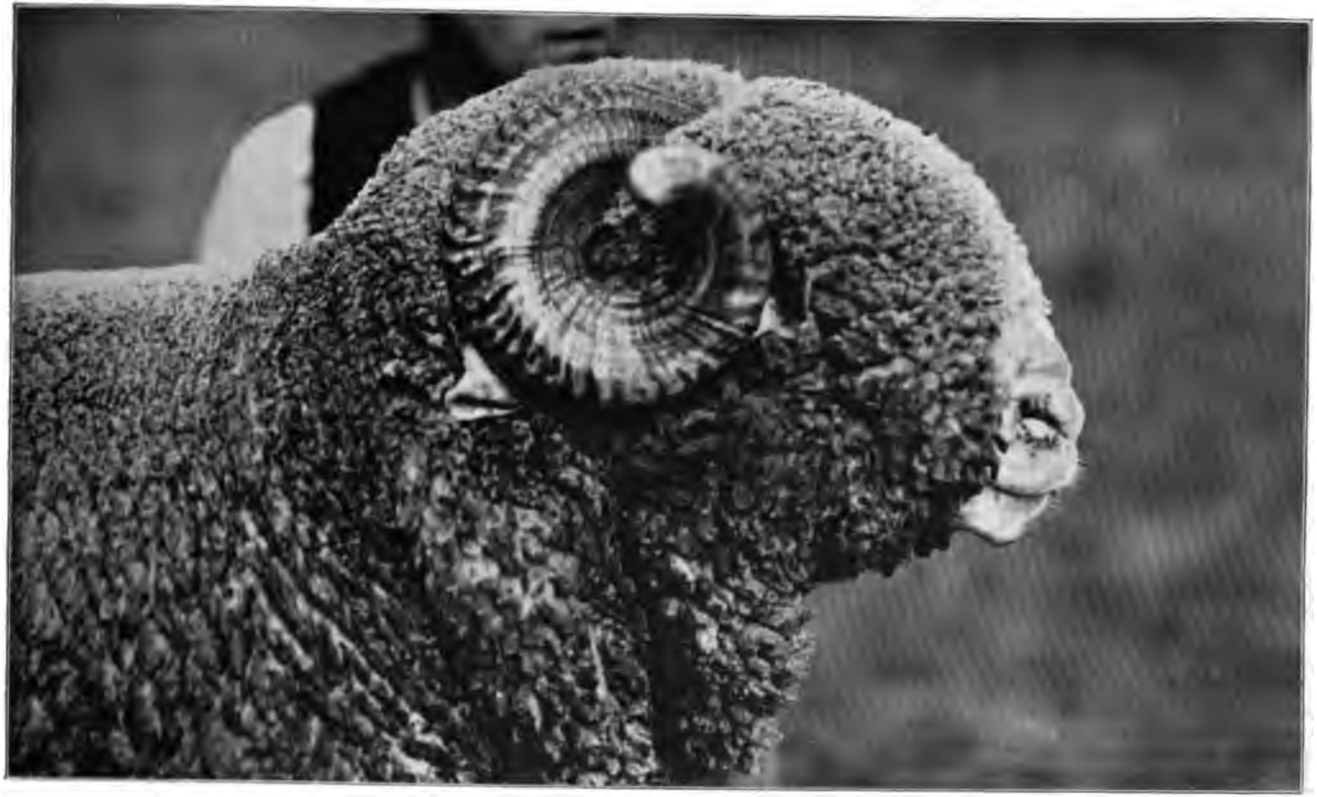
To the Wisconsin State Board of Agriculture,

GENTLEMEN:—I herewith submit my report as Superintendent of Privileges for the Fair of 1908. I received amounts as indicated in the following tabulated statement and hold receipts of your Secretary for the amount:

For rent of dining halls owned by the board	$1,500 00
For sale of ground for dining halls and tents	400 00
For rent of lunch rooms under grand stand	440 00
For lunch and soft drinks	3,384 50
For soft drinks only	291 00
For cigars and tobacco only	100 00
For sale of novelties, souvenirs and jewelry	1,455 50
For sale of ice cream only	450 00
For sale of candies only	253 00
For fruit-stands and wagons	149 00
For sale of cider only	180 00
For sale of popcorn only	105 00
For sale of peanuts only	55 00
For doll racks	89 00
For cane racks	121 00
For peddling privileges, grand stand	165 00
For wholesale supply privileges	125 00
For advertising privileges	1,253 00
For photograph galleries	161 00
For palmistry	187 00
For score cards	400 00
For toy balloons	37 50
For sale of pocket **knives**	30 00
For sale of souvenir postals only	145 00
For miscellaneous privileges	235 00
For sale of musical instruments	60 00
For knife racks	60 00
For novelty pool table	15 00
For bowling alley	66 00
For airship	350 00
For merry go-round and ferris wheel	450 00
For sign painting	10 00
For peddling privileges in stock pavilion	50 00
For percentage on Herbert A. Kline shows	1,941 50
For percentage on automobile rides	257 91
For storage on ice cream	70 00
For privileges reserved and not taken	142 00
For rent of telephone booths	180 00
Total	$15,366 91

The detailed report of the receipts is filed with the Secretary

Respectfully submitted, O. F. ROESSLER,
Superintendent.



Rambouillet Ram.

PROCEEDINGS

OF THE

Wisconsin State Board of Agriculture

IN ANNUAL CONVENTION.

AUDITORIUM, AGRICULTURAL HALL,
MADISON, WIS., February 4 and 5, 1909.

President McKerrow in the chair.

Prest. McKerrow: For over forty years during the first week of February there has been an agricultural convention held in the city of Madison; first, under the auspices of the old Wisconsin State Agricultural Society, and later under the direction of Wisconsin State Board of Agriculture. We are here today to open this annual convention.

Wisconsin has a right to be proud of herself; it is a just pride, a laudable pride along the line of agriculture and agricultural education.

Dean Berry of New York, chairman of the County Life Commission, said here in this building a few weeks ago that it was acknowledged that Wisconsin was the leader in the line of agricultural education and agricultural thought. From her common schools up through her county schools, her Farmers' Institutes to her Agricultural College, that is true. This came from an authority at the head of an agricultural college in one of our closest competitors. The truth is that Wisconsin does march in the fore front of agricultural progress.

We are proud to see that Wisconsin farmers are following a better system of crop rotation than are the farmers in any

State in the Union. More clover in proportion to the cultivated acreage is grown upon Wisconsin farms than is grown in any other State in the Union. More silos stand upon Wisconsin farms than can be found in any other State. The average yields for the past ten years of our small grains, wheat, oats, rye, barley and corn is right at the front in the average per acre, barring the States where irrigation is followed. Our million and a quarter of milch cows are producing a higher average in their product so far as we can find, than are the cows of any other State. Wisconsin has record-breaking cows, the winner in the dairy tests of 1893 came from Wisconsin, and the winner again at the World's Fair of 1904 came from Wisconsin. The two cows that held the highest world's official record, 1,000 pounds of butter a year and 1,164 pounds of butter a year are Wisconsin cows.

Why is Wisconsin at the front as a dairy State with more than $50,000,000 a year in dairy products? Why the best cows? Why the most clover? Why the best rotation of crops?

Simply because Wisconsin farmers do more hinking than the farmers of any other State.

And why do they do more thinking?

Because for over forty years they have been assembled in conventions like this; in dairy association meetings; in horticultural society meetings; for twenty-three years in Farmers' Institutes; for twenty years their sons have been attending the Agricultural College. All these things have induced thought amongst Wisconsin farmers and this has put Wisconsin in the front rank.

Now, I said in the beginning that we are proud of Wisconsin's agricultural department. Wisconsin is standing out today as one of the leading, if not *the* leading breeding ground for pure bred live stock of the highest order, because her flocks and herds win more prizes in proportion, at the animal shows, at the great fairs of the country, than do the flocks and herds from any other State.

Now, should we be so proud that we are self-satisfied? Not at all.

The progress of the past, the position we hold, should simply induce Wisconsin farmers to do more thinking and better work.

Wisconsin can continue as a leader in these fields but, she can only continue as a leader by giving more thought, more study, more work along all these lines.

Every agricultural interest of this State, every educational interest of this State is working harmoniously and moving forward.

Now, this convention in which we are assembled is under the direction of the State Board of Agriculture, and one of its largest fields of operation is in the management of the State Fair.

The State Fair of Wisconsin is forging ahead.

In the reports of the last Fair that we read in the Agricultural and Live Stock press, it was conceded that Wisconsin had one of the best, all-round educational fairs on the American continent; it is conceded that Wisconsin's system of fairs and Wisconsin's liberality with her fairs has produced one of the best fair systems to be found in any State in the Union, and Wisconsin has truly been liberal with her fairs as she has been with other lines of agricultural education.

Some $85,000 a year is annually paid out of the State Treasury to help this class of education.

I would like to talk for some time upon Fairs and how they may be developed and made better and stronger than they now are in this great State of Wisconsin, but time forbids; we must get down to the practical work of this convention. So you will pardon me for saying as much as I have said and for not saying any more.

When I was a boy, being reared upon a Waukesha County farm, I often heard it said by the old settlers that Wisconsin never would be a corn State, and in those days one, two and three acres of corn was about the limit on the clay soils of our county upon an eighty acre farm.

To-day, on those same farms, those same eighty-acre farms, dairy farms are growing, ten, fifteen and twenty acres of corn, a large part of it going into the silo and the balance being fed in a cured condition.

Twenty-two years ago when I began to do institute work in the State of Wisconsin and we got about the three southern tiers of counties, we heard the same story, "We can't grow corn," but to-day when we go up into the sixth and seventh tiers of counties we practically hear the same story, though the corn belt is moving northward; the intelligence of the Wisconsin farmer, his education, the work that is being done for him, is pushing the corn line northward and is enlarging the fields for the production of Wisconsin corn.

Today at this forenoon session we are to have a pretty thorough and exhaustive discussion of this subject, and it will come under certain headings, and will be opened by Mr. Thomas Convey of Ridgeway, Wis., who will lay the foundation for the crop by a discussion of the subject, "The Soil and Its Preparation for the Crop."

THE SOIL AND ITS PREPARATION FOR THE CROP.

THOMAS CONVEY, Ridgeway.

This country is the greatest corn producer, and will be likely to remain so, as it requires more than ordinary effort to raise a paying crop, if it did not, there would be an immense acreage planted the coming season, as a good crop would be likely to represent at least half the value of the land it grew on.

Prices are high, because the supply is not equal to the demand, and the surplus has been very much reduced.

On new land, in good condition, it is an easy matter to raise good crops, but to raise a big crop on old land, is a greater evidence of ability· The good farmer, does not aim to keep only a portion of his land so it will raise a good crop, but rather all of it.

Where a correct system is followed, this is not only possible, but easy. There may be other ways beside the one we have tried, but I doubt if there is any better.

For about thirty years we have paid strict attention, to a rotation of crops, ours being a three year course, clover, corn, and grain, seeding down with the latter. Clover is allowed to remain but one year.

The land is manured every three years, on the clover after cutting hay, we have only succeeded in getting over all of it. Since getting a manure spreader it is taken directly from the barn with one handling. This not only means less labor, but more fertility, not only immediately, but eventually, as the place to have the manure decay is in the land.

Having been a wheat and flax farmer, a considerable portion of the farm was absolutely poor, so we thought we would help things along by buying mill-feed. We average about three carloads a year, and have found by many years experience, that we have a double profit, a profit in feeding good stock, and a profit in the manure.

We have not succeded in getting the land better than new timber land, but that part of the farm that was prairie, is better than when new. A rotation is beneficial in many ways, especialy where clover is grown. It increases the fertility, improves the mechanical condition, eradicates weeds, lessens the liability of damage by insects, prevents blowing or washing of soil, and in a large measure prevents fungous diseases. Any one of those reasons ought to be sufficient to establish a rotation, I have never heard a valid objection. The objection that is made, the difficulty of getting started, becomes worse each succeeding year. It is only a question of time when some better farmer will take up the task and succeed where you have failed. The start is the only difficult part.

Our method is to spring plow, we have changed over from fall plowing and know we get better results. The land is harrowed about as fast as plowed, and planted as fast as prepared. The doctrine of keeping a growing crop on the land as nearly all the time as you can, I am a firm believer in. I received it in doubt, but now have absolute faith. I would still be inclined to fall plow everything but a clover sod. Fall plowing does not receive judicious treatment, as a rule. It should be harrowed just as soon as the ground will be sufficiently dry, and once a week at least, until planting time, it should be harrowed after every rain, one cultivation before may be worth two after planting. Good culivation, will help, but without land in good condition, the results will be poor. The past three years we have used alfalfa with alsike and medium clovers in seeding. We like it, but do not know whether it is much better for the land.

Prest. McKerrow: The discussion is the best part of a farmers' meeting and we want you to ask this man Convey a lot of hard questions and if he can't answer them it will please me all the better. I never saw him cornered yet, and I would like to see him cornered.

Mr. Scott: How deep do you plow this manured clover sod for corn?

Mr. Convey: Four to five inches. The clover crop prepares the land in large measure for the corn crop.

Mr. Scott: A sort of subsoiler, is it?

Mr. Convey: Yes, it is.

Mr. Scott: Do you find that the clover roots decay better when the plowing is shallow than if it were deeper?

Mr. Convey: Without question, a great deal better than if they are too far away from the atmosphere. It not only decays better, but it feeds the plant better, more rapidly, on account of not being at too great a depth.

A Member: Why not manure that clover sod in the fall?

Mr. Convey: The land will keep in better condition until we are ready to use it. It is comparatively little labor to prepare the land at that time.

The Member: If you manure in the fall you spread that manure on the sod and let it lie there all winter.

Mr. Convey: We top dress as soon as we get the hay off and keep top-dressing. We find the early top dressing gives the best results. We top-dress all the year.

Mr. Underwood: Would you favor early plowing in the spring?

Mr. Convey: We favor early planting and we plow and hurry the planting, do it right along, right off, one after the other. We aim to plant early, but of course there might be an objection to that. You might have to let the ground go so long it would take too much moisture out of the ground and that would be a detriment to the crop, but we aim to plant and plow early.

A Member: Don't you think it would be a good idea to plow as soon as you can in the spring and keep to work on your ground, keep it well cultivated, or do you think it would be better to plow just before you plant, getting it ready for planting just then.

Mr. Convey: We get splendid results on the farm by plowing and working it just before we plant corn. We have not tried spring plowing early; possibly we might get better results, there might be more preparation of the soil where you plow earlier, but as a matter of practice, you have to plant other crops first.: Being on the highland, we run a very little risk with spring plowing.

Mr. Nordman: It depends a good deal upon the character of your land. If the land is rough, or more hilly, there is danger of washing if you plow it early or plow the fall before; it is better in every such case to wait just as long as you can so that the clover roots and the other fiber in the soil will hold the soil in place. A heavy rain coming onto the land if you prepare it a long time before, will wash deep gullies into your land that way, while, if you wait until just previous to planting, on quite hilly ground there will be very little danger of its washing.

Mr. Convey: If you will treat the land the way I suggest I think you will have very little washing, top-dress with the manure every three years and plant clover and the land will not be inclined to wash. After all it is just as well to wait where the circumstances permit you to do so.

Mr. Nordman: I treated my land as you suggest for a number of years and I found it was necessary for me to do as I say. A few years ago I thought I would plow the land early, so as to make more of the fertility available, and the result was that I got my land full of ditches that year and since that time I have avoided it. It all depends upon the character of your soil. There are some soils of course that will wash much easier than others; a man has got to find that out.

Mr. Convey: Another feature of this question that I did not speak of was the fact that the rotation I followed I would not consider the best under all circumstances. For instance, if your farm is all equally capable of cultivation, I would prefer a fuor-year rotation, the first year for hay, the second for pasture, then top-dress with manure and plant corn and then seed down for the year following. I am not much in favor of a permanent pasture, you don't get as good results, you get more weeds, more insect pests and I would rather bring all my land under rotation if it were so situated that I could.

Mr. Nordman: There is one other point in regard to the time of planting of corn. In the northern part of the State we have to be very careful about the season of the year when we plant. If we go to planting corn, say, about the 20th of May, or earlier than that, and a cold season follows a great many of those seeds fail to germinate; on the other hand, if we wait, take it one year with another, until the first of June, or somewhere close to that, we are almost sure of getting a good stand, so we prefer to wait until the weather gets good and warm, so it is going to stay warm.

Mr. Convey: That will more properly come up under the next subject. Another feature of our corn raising is, that we grow our corn so as to have the rows as nearly level as possible. and that in a large measure guards against washing.

Mr. Nordman: I am afraid you are getting over onto Mr. Hill's subject.

Mr. Convey: Not necessarily. I am just getting as far as the planting, I am not talking about the planting itself. Then too, on quite a number of farms in this State the land is really too flat to work to the best advantage some seasons; it holds the moisture late, and with land of that character you can get drainage in a measure by laying the rows one way. We furrow our corn one way and cultivate it that way. I know that Prof. Moore has stated it was not practical to raise corn that way, but I have been doing such an impractical thing as that for about fifteen years now, and I like it.

President McKerrow: You see he is "sot" in his ways.

Mr. Underwood: Do you have any trouble in keeping your corn free from weeds?

Mr. Convey: We have on the ends of the rows more or less weeds every season and have to do hoeing. Last season we hoed more than we ever did before, on account of it being so wet: we couldn't get the weeds out without some hoeing, but that is a very unusual thing with us.

Mr. Underwood: I have been raising corn that way ten or fifteen years myself, but I ran up against it last year; the weeds grew faster than I could take care of them and I said to myself that this would be my last planting in drills.

Mr. Scribner: We have practiced four-year rotation on our farm for six or seven years and we find that our land becomes better adapted for the corn crop. It makes a good home for the crop, brings about a good condition of the soil. In traveling up and down the eastern side of this State we find the lands in bad condition physically, in a lumpy condition and also that after the land is held in rotation for a number of years, it gets in much better condition. So that we advise all we know to use the rotation, especially the four-year rotation which I think is the most practical.

We plow in the spring, we want to give it a thorough cultivation, make a good place for the seed to grow in before we put it in, make a thoroughly pulverized seed bed.

A Member: Why do you recommend the four-year rotation? Isn't it a fact that the first year, either hay or pasture, the crop is always better than the second year? With one year you get a bigger crop, from the first seeding, than you will the second. Another thing with the four-year rotation, you carry the timothy over and it seems to me the more timothy you grow on your land, the poorer it gets. You can get one crop of clover and then you are through; you are obliged to sow timothy. I am not a believer in timothy.

Mr. Scribner: Neither am I a lover of timothy, but when we use it simply as a pasture plant, it is not a soil robber. Where we are dependent on pasture we cannot depend on clover,, so we like timothy to fall back on. If I were sure of clover, I wouldn't care so much, although after all I like a variety of grasses.

A Member: Have you ever used commercial fertilizers?

Mr. Convey: I have not. I do not consider I have any occasion to. I buy enough mill feed to take the place of commercial fertilizer, and I know my land is getting better every year and I would not advise the farmer to build up his land that way; that is, by commercial fertilizers. The other way is much better.

The Chairman: The next topic on our program is that of Seed Selection and Care, to be presented to you by a very enthusiastic gentleman. In conversation with a party a few days ago on this question of enthusiasm, he made the remark that enthusiasm was a form of error.

Now, any form of error that will increase the corn crop is one we will endeavor to cultivate, and therefore I am very much pleased to introduce to you this enthusiastic advocate of good seed, Prof. Moore.

THE SEED; SELECTION AND CARE.

PROF. R. A. MOORE, Madison.

While a good many factors enter into our consideration when we desire to grow a crop of corn, yet I feel that there is no one factor that is of more importance than good seed.

Take our men who have helped to make Wisconsin the great dairy State of America, we all know that they have relied very largely upon good breeds of stock and they are putting forth their most valiant efforts today to improve the breeds of their stock. Those who have brought forth good breeds of hogs and sheep have contributed largely to the success of our State and they have put forth those efforts in that direction, realizing the importance of those good breeds, and they know that they are sure to succeed by getting good foundation stock.

So it is with the seed grains, although this subject has been neglected for a great many years,—we had good stock upon our farms long before any attempt was made particularly in the growing and selection of breeds of corn, barley, oats or rye. We realize that the animal husbandman had got ahead of us, and we as crop breeders must make up this deficiency in some way, and consequently during the past few years we are putting forth every effort that lies within us to produce these good seed grains which will increase the crop, not only for a single county, but for the entire State.

We feel that by pushing this work forward that we will be enabled to live and make money upon these high priced lands. We feel at the present time that our land is of such a high price hat no longer can we afford to market crops at the regular market price, but by getting the proper kinds and qualities of seed grains and selling them, not only to people throughout our State for the production of better crops, but to have a flow of money running in from the other States, then we will be able to realize on our investment on these high priced farms.

Like Mr. Convey, I do not wish to intrude upon those who are going to take part in the discussison of this important subject, so I have reduced my few remarks to writing which I will read, and then we can take up this subject in a general discussion as you see fit.

The subject assigned me is one of great importance to the farmers of Wisconsin and I trust what I may say will in some way reach those in need of information along this special line of effort. From careful tests made at the Experiment Station Farm and elsewhere, we have demonstrated that the yield of good corn is largely determined by breed and the energy and vitality in the seed corn. All other things being equal, I think it safe to say that double the yield can be secured where high bred corn of strong vitality is used in comparison with ordinary air dried scrub seed corn.

The general yield of corn in Wisconsin as reported by the U. S. Department of Agriculture in 1908 was 33.7 bushels per acre, the yield of corn as reported by 154 members of the Experiment Association for 1908 was 56 bushels per acre; the yield on the Station Farm was 93.6 bushels of shelled corn to the acre.

A large portion of this advanced yield has been brought about by using definite select breeds of kiln-dried seed that was high in energy and vitality.

There is a special advantage in growing corn the seed of which has been carefully selected, cured and tested.

We now have six standard bred varieties of corn for Wisconsin, and these standard varieties have been so widely disseminated that within another year seed corn growers located in practically every county of Wisconsin will be able to supply the farmer with select seed that has become properly acclimated to the environments of the respective locality in which it is to be used.

The following are the standard varieties upon which several years patient work has been performed to breed and acclimate them to various sections of the State:

Silver King (Wisconsin No. 7), Golden Glow (Wisconsin No. 12), Clark's Yellow Dent (Wisconsin No. 1), Early Yellow Dent (Wisconsin No. 8), Toole's North Star (Wisconsin No. 11), and Smut Nose Flint (Wisconsin No. 15).

Method of breeding briefly given.

I think each and every farmer should have a select seed patch of two or three acres planted by the same variety of his general field and grown in connection thereto. This seed patch can be planted in accordance with the ear-to-the-row method, using the seed from each ear separately. By selecting the seed from the high yielding rows considerable advancement can be made in the way of securing seed of a much higher projected efficiency than securing the stock from the general field.

Where the farmer becomes a seed corn grower his general stock for the market is taken from the general field, usually from ten to twenty per cent of the ears, depending upon the breeding, are selected for seed and the remainder used as crib corn.

Where seed corn is selected from the seed patch we take the best ears from five or six of the best rows, picking the same from the stalks after it is well ripened, kiln dry the seed and save for the seed patch and general field the succeeding year.

Where seed corn is selected from the general field we should leave that particular part of the field we desire for seed until the corn is well hardened if the corn is glazed firmly an ordinary frost will not injure it and we find it is much better to run the risk of sacrificing some of the fodder than to sacrifice the energy and vitality of the seed corn which we do if we harvest too early. It is an exceedingly good plan to cut with harvester and shock, leaving the shocks in the field for two or three weeks before husking. It seems that corn left in this way goes through a curing process which makes it of higher vitality than that picked direct from the stalk. When the corn is husked it should be separated into three divisions, viz., seed corn, feeding corn, and nubbins. The seed corn should be taken from the field daily and not left to lie on the damp ground through the night without protection. Several years' experience with seed corn leads me to believe that no one factor is so important in connection thereto as the kiln drying of the seed. By this process we lock the energy and vitality into each individual kernel where it will remain to do its valuable work after planting.

The kiln drying process or fire drying of corn as it is sometimes called is simple and any farmer by observing a few important factors can kiln dry corn perfectly. For a small amount of seed the kitchen or a room having a stove within it in furnace room where sufficient amount of heat and ventilation can be obtained for the purpose is all right and works well, but if the desire is to kiln dry several hundred bushels of seed a suitable building should be arranged. Often a building already upon the farm can be used by slight alteration.

The chief requisites of the building are that it should be free from mice and rats, with ample means of ventilation and ceiled overhead so heat will be retained where needed. Corn racks of cheap material can be erected within the building on which to pile the ears, usually a 2x6 upright with 2 inch strips nailed on the sides directly opposite with an additional strip between to prevent the ears falling through is sufficient. These strips should be about 10 or 12 inches apart from top to bottom with about 3 feet of space between the uprights. Sufficient room should be left between the corn racks so that a person can pass readily between with a bushel basket.

A shielded stove should be placed well toward the front of the room, the pipe of which should be run overhead to enter chimney in back of the room if possible; this arrangement admits of a large amount of heating surface.

The corn when first brought in for the purpose of kiln-drying should be put on the corn racks in single or double rows, it will not dry out readily and may be damaged if an attempt is made to pile it more thickly. All windows should be raised or lowered from the top so that an abundant circulation of air can be had in the room. It is often well to leave the door open or have screen door in order to help circulation.

A good fire should be kept in the stove, fuel being added from time to time. The fire should not be run for any great length of time without having windows and door open for the moisture driven from the corn soon saturates the atmosphere within the room and will facilitate the sprouting of the corn. It is not necessary to run the fire continuously but wood can be put in the stove at intervals. After the corn has been dried for two or three days it can be piled more thickly on the racks without detriment to the corn. It is necessary to repile from time to time to make room for more corn.

After the corn has been well dried the room should be closed so as to keep it dry as possible. The seed corn can be kept therein. For the present time for the curing of moderate amounts of seed corn the above described building answers the purpose fairly well.

When the corn has gone through the drying process it is well to make germinating test by taking one or two kernels each from one or two hundred ears; if the germination is perfect the corn can be crated and sold in the ear, the only reliable way to dispose of seed corn.

Good prices can be secured and should be charged for good seed, but under no condition should inferior ears be put on the market and worked off on the purchaser. It should be remembered that not more than one-fifth, and often less than one-tenth of the total yield of corn can be used as seed ears.

Now, just a word in regard to our methods of breeding corn. I am sure many of you will be interested in knowing some of the methods that we employ in that work.

In the first place, we take our foundation stock. We go to work and take definite rows in the field; we go down through those rows and we will mark certain selected stocks that we think come up to our expectation. We spend a great deal of time selecting that first stock; we go into the field at the time when the crop can be judged, when the corn is in the milk stage, or just beginning to glaze, when the roots and the whole plant show to the best advantage. We find that there will be a large variation in these particular stacks, some will have long shanks to the ear; others will have short shanks to the ear, close up to the stalk. We will find some stalks as large as your arm, much too large, and we will find some that are much too small. There are hundreds of variations that we find in the corn, many of them not desirable. We note those which have the desirable characteristics and mark those particular stalks. We go on through the field after marking the first stalk, and we select several other stalks as near as possible to our ideal until we have selected, we will say at least three hundred stalks, all of which we mark. Then we will let this field of corn ripen up, because we do not believe in picking the corn from the stalk until it is entirely ripe. Then we go down through the field and we select our ears from those particular stalks that have been marked. We will mark those with a little string or a clothes pin or in some way. We will take three hundred of these ears, and after husking, we will find that a great many of these ears do not come up to our expectation at all, and we will cast them out, say a hundred. Then we will take the other two hundred ears, and after taking them from the field, we will thoroughly kiln dry them and put them through the test. We will go to work and make the test, and in order to do so we will take at least four kernels from each ear, and in selecting those kernels, we will take one from the butt and one from the center here and another from the center here, and another from this end, until we have taken four kernels from different parts of that ear. We will put them into a little wooden basin, marked out in squares, we will have those ears put on planks and marked so as to correspond with the corresponding kernels. You can see here, this test was made from kiln-dried corn, and all the kernels have sprouted nicely. Now, here we see in this general test, No. 18, does not give a good test, practically only two kernels have sprouted. So we throw that out entirely. The ear from which those kernels came is probably just as good for feed as any other ear, but we are going through a process of elimination and probably at the end we will have one hundred of these ears, whose kernels have developed in such a way that we are willing to take and put them into our breeding plot. We take those ears and plant them in our breeding plot. We take the kernels from a particular ear, take a portion of those, and put into one row; we will plant those hills a definite distance apart, usually three and a half feet or three feet eight inches, putting a definite number of kernels in the row, and finally when we have this complete, we will have a certain number of rows of the tested and planted seed in one hundred ears. There will be one hundred rows; we will not take all the kernels, but we make sure that the row will not be longer than it can be planted from the one ear.

Now, there is a special advantage in doing that, which a great many have never thought of; but that is one of the things in particular that has enabled us to get a high grade of corn. You would really be surprised at the difference that there would be in these certain ears of corn. We find that an ear of corn has individuality just like a human being. We find that some of those ears of corn have energy, what we call projected efficiency to give those great high yields and breed true to type. What is true of cattle breeding, we may say, is true of corn breeding. We will have a whole lot of these ordinary ears that just about come up to the standard, and will give a yield of fifteen, eighteen, perhaps twenty bushels per acre; we will have some that will give an average yield of thirty or thirty-five bushels to the acre, but in that seed plot we will have some ears that go way beyond anything we have in this breeding plot, that will not only give twenty bushels per acre, but will give up above a hundred bushels per acre.

We have had some that will throw fifteen times as much good seed corn to the acre as other rows in that particular field, and in that way, we have been able to advance the yield.

There is something in an ear of corn that we cannot see from the outside; it is buried in there and the only way we will be able to get at it will be to put it to the actual growing test, and that is what we do in breeding corn, we get this corn in the ground and then judge entirely by its performance record, and when we are able to get that ear that gives a great yield, double, treble or ten times the yield of another ear grown under similar conditions, we have the key to the situation of corn breeding; and we have continued that line of work for a number of years on the station farm until now we have our corn so that we do not have the great variation that we used to. We always take for our breeding plot the second year those particular ears that come from that high yielding row; that is, the three, four or five high yielding rows we will use for our planting in the general field, for the general field each year is planted to corn of high energy and high vitality and high projected efficiency.

I think each and every farmer should have a selected seed patch of two or three acres, planted to the same variety as his general field and grown in connection therewith.

We have not done anything on the Experiment Station farm that an ordinary farmer cannot do by using intelligence and good methods. We have not proceeded along any hard lines of breeding, we have just used a common-sense method, because I believe that the great things in life are the simple things, and if we look about us we will see that all around, close to us are these things waiting for us, and all we have got to do is to get right at those simple things and those are the things that are the great things in life, and so it is with the growing and breeding of corn. I feel that the average farmer must get at that, as well as our seed corn growers.

DISCUSSION.

Mr. Scribner: Would you fill that corn rack up full, or simply lay one or two rows on the rack?

Prof. Moore: I would simply put a single row in there. Possibly if the corn is pretty well cured, before gathering in, there would be no harm to put a double row, and after we have started putting this into our kiln and have run it for a day or two, then we can begin to pile in full and make room for the other corn, but when it first gets in it is very important that it should only be put on one row, or not more than two rows. Just as soon as the corn begins to become loose on a cob then there is no danger of its sprouting, but before that time we are liable to sprout our corn if we have it piled too thickly together.

Mr. Stiles: How far would you plant apart to prevent the different types mixing?

Prof. Moore: Corn will pollenate in a strong wind eighty rods away. During the pollenating period, there is a great cloud of pollen working off, and it has been known to go even over a quarter of a mile. However, by using judgment in your method of planting, you can do away with a great deal of this. If you get your corn to the south or west of another field of corn, it will not run much risk of crossing, but if your neighbor has a field across the road on the side of you, you are likely to get it from your neighbor's field. But if you can put your seed patch on the south or the west side of your general field, do so, because the wind during all the pollenating season is most all from the south or southwest; it is very seldom we ever have a wind from the north during the pollenating season.

Mr. Convey: In planting your test rows, with single ears, you cannot avoid having a mixture, you cannot provide against pollenization.

Prof. Moore: We have those a long distance apart; we do not put them in the same field.

Mr. Convey: But even in your testing, you find a great deal of difference in variations?

Prof. Moore: Yes.

Mr. Convey: Can you guard against pollenization by detasseling?

Prof. Moore: We have been doing it in our breeding plots, detasseling certain rows and selecting our seed from the detasseled rows. Prof. Hunt has carried on work along that line.

A great many parties will say to me, I do not see any use going through this kiln-drying process; my corn sprouts all right. Yes, it may sprout, but it may have only thirty or forty per cent of energy and that is the danger, in getting this 25 and 30 per cent energy corn in your field. A great many of those stalks of the corn that have only 30 per cent of energy are barren stalks.

Mr. Olds: How long would you recommend leaving the corn in the field before getting it in; how long is it safe to count on its not being damaged by severe freezing? How much will it stand, how low a temperature?

Prof. Moore: I find that corn that is well protected by the husks holds its vitality to quite late in the year. There have been left stalks right out all winter and we have made tests and we have found that even in the middle of January and I think even our February tests show almost a perfect energy and vitality. We find that later in the year, toward spring, when the freezing and thawing begins, then it begins to lose its energy and vitality and in the spring we get very low germinating tests. But while it is protected with its natural protection, the husks, it is really surprising the amount of frost it will stand without being materially injured. When we put corn through the kiln-drying process, then we can subject it to almost any amount of cold. In its normal state, we find that at least there is one-fourth water, and then through the air-drying process we can cut it down five or six per cent, but still our corn will have 16 or 18 per cent of moisture in it, and when we get hard freezing weather that moisture freezes within the kernel and reduces the energy, whereas the kiln-drying process reduces that water down to 5 or 6 per cent and of course it is safer. Corn that has been through the kiln-dried process has within it all the energy and vitality that will enable it later to come forward at the proper time when conditions are as they should be, and that answers the objection that is sometimes made that kiln-dried corn shows smaller kernels than the air-dried corn.

The Chairman: What you have lost in size, you have gained in condition?

Prof. Moore: Yes.

A Member: You would not leave your corn until January?

Prof. Moore: We cut our corn about the last week in Sep tember or the first week in October. We find when corn is pretty well ripened up a little frost will not damage it.

Mr. Scott: If that corn is kiln-dried and put in a building and there is such weather as this, is it injured?

Prof. Moore: Yes, corn will take in moisture very readily. It is really surprising to see what a few days of moist weather will do to it, it will become almost completely saturated going way back to its normal air-dried state. So we are very anxious about keeping the corn in a dry place after we have once had it kiln-dried.

Mr. Cunningham: Would you prefer to pick the corn while it is standing or wait until it is cut by the harvester and stands in the shock?

Prof. Moore: If we are going to use our corn for fodder purposes—and I wish to commend the people of Wisconsin in this matter of using their corn in comparison with the way that I have seen some people use corn down in the so-called corn belt. Where we desire to use the corn for fodder purposes, and wish to get an abundance of leaves, we like to cut the corn just when it is well ripened, if we desire to use it for forage. Then there is an advantage in shocking the corn and leaving it two or three weeks in the shock over what there would be in selecting the corn by going through the field at that particular time when we wish to harvest. Some select their seed corn before they put the harvester in the field. It is much better to put your harvester in and then leave your corn in the shock for two or three weeks; there is a great deal of vitality and energy which go into the ear from the stock after the stalk has been shocked.

Mr. Ames: In propagating for your seed, would you reject any part of the ear?

Prof. Moore: I would invariably reject the butts and the tips. They will not plant regularly; you put them into the planter with some of these small tip kernels and they will drop more than you desire to have dropped, and if the butt kernels get in, you won't drop as many, because they are irregular, consequently we reject the butts and tips for that reason. Another reason is that the tip kernels and the butt kernels are more tardy in germination, consequently if we plant them with the other kernels, they come on two or three days later, and consequently the other kernels have got the roots down in the ground and the plants shade the ground and rob the moisture and fertility below, and the sunlight above and get ahead in the race of life, and a great many of those will be barren stalks or stalks that produce mere nubbins.

A Member: Do you use the grader?

Prof. Moore: The corn grader is a good thing to use.

Mr. Hill: Don't you think that in rejecting end and tip kernels in a long continued breeding course, you might breed the kernels all off the tip? They say you can get a muley breed of cattle by cutting off their horns.

Prof. Moore: I don't think there is any danger of anything of that kind happening.

Mr. Scribner: We have never bred the tails off yet.

The Chairman: This gentleman that just spoke, Mr. Scribner, ought to know; we consider him the "cow" man here in Wisconsin.

The Chairman: Some twenty-two or three years ago when it was my privilege to first attend Farmers' Institutes, I heard one of Wisconsin's farmer talk on corn growing, and saw him exhibit some samples produced upon his farm, that in many respects were equal to the noted pure bred Wisconsin corn of today. I have kept pretty good track of that gentleman ever since, and I am pleased to introduce to this audience today one of Wisconsin's veteran and best known farmers, Mr. G. C. Hill.

PLANTING AND CULTIVATION.

GEO. C. HILL, Rosendale.

You doubtless remember in those days when you taught the young ideas how to shoot, that when your lecturers came on the stage, they had different ideas as to how they should greet the audience. One was a sort of surface cultivation; the other was this low-down, deep cultivation. Now, I want to give my most profound greeting to the present farmers of Wisconsin and the future farmers of Wisconsin, especially.

With the soil prepared, and good seed provided as recommended, two prime requisites are furnished for growing a good crop. If the seed were properly planted and the field left without further care, there might result half a crop. The other half is gotten by cultivation.

With wide variations of latitude and the growing season, no fixed rule for time to plant will apply to all corn fields of Wisconsin. When conditions are favorable the corn growing season extends from May 15 to September 10—about one hundred and twenty days. With less favorable conditions the time may be shortened to ninety or one hundred days. If the variety will mature within the shortest period, I should expect the best results by planting about the 25th of May. At that time we expect the conditions favorable for quick germination and vigorous growth. In earlier years it was my practice to plant two weeks earlier, resulting, probably, in a week's gain in crop maturity.

But the chances for green fields were increased. On large fields planting should follow quite closely the plow and harrow rather than to wait until the whole is prepared.

Growing a crop of corn is like managing an agricultural fair, the success depends on how the weather turns out. It is sometimes the case that when the field is ready for planting there comes a deluge of rain, compacting the soil and leaving it soggy and liable to bake. In such case the field should be newly prepared, even if the extra work delays planting for a week or more.

In pioneer days the corn-planter was a man with an ox and a pouch of seed. The machine followed the breaking plow—a gash was cut in every third furrow slice, seed dropped, and covered with a press of the foot.

In these days, any machine that plants in straight rows, about two inches deep—enough seed to insure not less than three nor more than four plants in each check, may do the work. If the crop is intended for silage, and the variety grows eight or nine feet high—I would plant 3 to 3½ feet. For other purposes, and with a larger variety, the distance might be 3 feet 8 inches. Observation and experience has proven to me that cleaner culture results from growing in the check method.

To insure quick and even germination, the soil needs to be pressed over the seed. The wheels of the planter may do this, but where the hand-planter is used on light or dry soil, a roller should be used. Planting will not do the work, but the wheel marks of the planter and roller should not be left to cause ba-ing and evaporation. As soon as a field is planted, harrowing should begin, repeating every day or two until the plants appear above ground.

This results in destroying millions of embryo weeds, and the young corn plants have a fair start in the race.

In all the operations thus far, it should be the aim to entirely rid the field of the first crop of weeds. I have had no experience with the weeder, and we do not now harrow corn after it is above ground. If such work is done, it should only be done in the afternoon of dry days.

My first corn crop was grown in 1854, and was cultivated with a 14 inch plow, operated by a yoke of oxen and a sixteen year old boy. Then a good deal of work was done in hand hoeing, and, after all, the crop was always choked with grass and the land left in ridges. Now we have a variety of machines that do vastly better and easier work than the old plow and hoe did. The main thing is to keep them moving.

Not having visited the recent "Great Corn Exposition" I am not prepared to recommend the last creation in cultivation. I would not use a machine with large shovels. The disc cultivator with the leveler attachment has done good work. I consider the levelers an important attachment to any "two-horse" cultivator. They smooth the ridges, and expose the weeds to the sun. Frequent cultivation should be the rule. You have heard of the man who always beat his neighbors in raising cabbage. When asked for the secret, he said "I hoe the patch every morning when the dew is on." Whether his success was due to the dew, or due to the frequency of cultivation, is a question.

The special needs of the growing corn plant are heat and moisture. Both are supplied by surface tillage, resulting in decreased evaporation of soil moisture. It takes a lot of heat to evaporate water. Surface culture retards evaporation and retains heat, thus killing two birds with one stone.

We are almost tired of hearing so often of the dust mulch, but the years are few when at some time, the growing crop does not need to have it spread on. There were fields of corn in my neighborhood that went through the pinching drouth of last summer suffering little loss from lack of moisture. There were others where the crop was cut in half, largely due to improper or lack of cultivation.

Cultivation plays another important part in crop growing.

Frequent stirring aerates the soil and thereby increases its productiveness. If we do not know all about the chemistry of the process, we know the fact from experience.

Deep cultivation is unnecessary, and may be injurious. If for any reason weeds get a start, it may be necessary to go a little deeper to cover the weeds, throwing soil over them in the row. When this is done the ridges should be dragged down by crossing with the weeder or small-toothed cultivator.

The old farmers used to say,

"Fourth of July, wet or dry,
Leave off hoeing, go to mowing."

Modern methods harvest more hay in June, and more cultivation is done in July.

A single horse and fine tooth cultivator can be used until the tassels show on the field. I have looked over corn fields on our farm when being cultivated, and the horse's head was the only part of the operation that was visible.

The cultivation of the corn crop is relied on as the chief means for cleaning the land. I am not promising that the cultivation of the corn crop will entirely rid a field of quack-grass, but I have seen it so subjugated that it caused little harm to the corn, as well as to the immediate crop following.

Where land is infested with patches of quack and other perennial grasses and weeds, it is best to do some hand-hoeing for the good of the present and future crops. I am not referring now, to the great fields of the South and West, but to the smaller, better cared for, and more productive corn acreage grown in rotation on Wisconsin Farms.

DISCUSSION.

Mr. Scribner: How do you lay out your rows, north and south, or east and west?

Mr. Hill: I never pay any attention to that. I go according to the shape of the field on level ground.

Mr. Scribner: I think we ought to lay out our fields so as to get the most possible sunshine in every row.

The Chairman: You would couple with that all other things being equal, wouldn't you? Suppose it was down a pretty steep hill, you wouldn't want to lay the rows so that the water would run down?

Mr. Convey: I never took any stock in that statement about getting more sunshine into a cornfield. I think if you get all the sunshine necessary and all there is when the sun shines, it is immaterial which way the rows run. Our rows run north and south, but I have been in all kinds of corn fields and I notice that the sun slants right down from above and I think if I cared to get into the argument at all, that I should feel that I would get more sunshine in rows that run north and south.

The Chairman: We will take Mr. Convey's apology, because he is right down where if the sun does any good at all, he will know it.

Mr. Scribner: The trouble is he is in the shade, he doesn't get the sunshine.

Mr. Stiles: What time in the season would you prefer to plant your corn for husking purposes?

Mr. Hill: I don't make any difference. I want my corn planted in such season that it will cure for any purpose. As I said, I plant somewhere around the 25th of May and I find I have produced better results, all things considered, than when I used to plant two weeks earlier. That is in the lower and middle portions of the State, Fond du Lac County.

A Member: What is the depth of planting in ordinary prairie soil?

Mr. Hill: An inch and a half would be sufficient, providing there is plenty of moisture near the surface. But if the season was a little shy of moisture, I would want it down two inches deep.

Mr. Scott: Would you say that we would not have better results in planting the 15th of May than the 25th providing we have good, strong kiln-dried seed?

Mr. Hill: The main object in delaying the planting, is that we have a better opportunity to control the first crop of weeds. We can get them up and destroy them if we wait until the 25th of May, and this first crop is more difficult than any other to get rid of. If we do not kill them before the corn comes up we have a great deal more trouble.

Mr. Convey: What have you to say about the use of the weeder and the harrow?

Mr. Hill: I think they are two of the best implements to use in the corn field. We use the weeder immediately after the cultivator, if the ground is nice and mellow. I wouldn't attempt to keep a corn field clean without the use of the harrow and cultivator.

Mr. Underwood: Have you ever followed the planter with the cultivator and then harrowed?

Mr. Hill: No, I just depend on the harrow and harrow almost every day.

Mr. Underwood: I follow the planter as soon as I can, with a two-horse cultivator. Then I put on the harrow after that, and I think that the one cultivation that I give my corn before it is up is worth more than two afterwards. I cover up the row entirely, not too much of a ridge, and I want to level my ground again.

Mr. Scribner: We have got to take into consideration different soils when we talk about this thing. If we are on clay soil, we can do the work and cover up the row again, but we are likely to have an entire failure. We must look out for the character of the soil.

The Chairman: But your harrow takes the ridge down again.

Mr. Underwood: That is the idea. After you get through your seed is no deeper than it was before. The idea of harrowing is to mellow your soil and kill the weeds.

Mr. Scott: On these heavy clay wet soils, you must have more shallow planting.

A Member: We cultivate, but instead of using a harrow we use a weeder. I would like to know if this gentleman runs his weeder the same way when he cultivates?

Mr. Convey: We cultivate all in one direction, we never throw up much of a ridge. We use the Tower cultivator and keep the ground level, so we go in the same direction as the corn is cultivated. If we went the other way, the horses would tramp more or less on the corn. We also plant corn almost double thick to what we planted it formerly, and try to harrow it thin, but we never succeed in harrowing it out any way.

A Member: Do you have any trouble with the harrow drawing down the hills where you harrow so much?

Mr. Hill: I never have seen any trouble from that, but of course I never would harrow corn when it is wet.

Mr. Nordman: Do you use this fine-tooth cultivator or do anything special to your cultivator?

Mr. Hill: No, the teeth are so fine it leaves the ground very fine.

Mr. Underwood: I follow my cultivator with this small tooth harrow; it is what we call a spike-tooth harrow. You can set your cultivator any width you choose, and I follow my cultivator with that after each cultivation, and I like it very much.

Mr. Nordman: A tool of that kind would be specially important in the part of the State where I live. There are a great many of these small cobble stones. If a fine tooth cultivator will work up that ground, it would be a very valuable tool.

A Member: I would like to know if any of the gentlemen in this section of the country have ever used a Tower cultivator?

Mr. Convey: For many years Mr. Wylie and I have traveled together in Institute work and we are always quarreling about cultivators. He used the Tower cultivator and I used the disk cultivator. He maintained his was the best, and I thought mine was the best. But I bought a Tower cultivator two years ago and I find it very nice. It probably is the best of all, because it is so much handier. In every case I would insist on having a lever attachment, because it not only cultivates the ground, but it also gets out the weeds.

The Chairman: Mr. Convey really likes the Tower cultivator the best, but he doesn't want to give in altogether, because he doesn't want to agree with Wylie.

Mr. Nordman: Can you use the Tower cultivator on gravely ground?

Mr. Convey: The knives are inclined to get dull, that would be the only trouble, but in any case I would not be without a cultivator of that kind. We grind the knives on an emery wheel. If I had rooty or very stony land, I think I would prefer the disk cultivator, because you can't always take care of that soil, but if the soil is in the right condition, the Tower cultivator is the best thing I have ever seen.

A Member: I have been in the territory where the Tower was used. The soil is somewhat stony in the territory where I live, and I find that it will not work there, because it is inclined to cut the corn off.

Mr. Cummings: In order to work successfully, I think the Tower cultivator must have fairly level soil and must be free

from obstacles, such as stones and roots. If you have such obstacles in your soil, I do not think you will have marked success with the Tower cultivator. On my land I have used it three years and find it very good.

The Chairman. The next topic is the "Harvesting and Securing of the Crop." As this is a job that needs muscle, we have got a man to handle it that has a lot of muscle and sinew.

HARVESTING AND SECURING THE CROP.

W. F. STILES, Lake Mills.

How shall we harvest and secure this crop, which in reckoning the grain alone is the greatest crop grown in this country.

The farmers of Wisconsin believe that they cannot afford to harvest it as many of the farmers in the sister states in the South and West are doing, and I am sorry to believe there are some in our own state—though a fast diminishing number, so that at least 25% of the crop is lost.

Actual tests have proven that with the average field of corn which had been planted with the object of obtaining the maximum amount of ears, that 30% of the feeding value of the crop was still left in the stalks if then even harvested and cured as they should be.

Now with feed as high priced as at present, can we farmers afford to lose 25% of this "King of Crops?" I hardly think so. The manufacturers of machinery have come greatly to our aid in the past ten years. Yet, the corn harvester is not as satisfactory a machine as is the grain harvester. But there is one advantage the corn crop has over the grain crop, and that is that it can be harvested and secured by hand if the acreage is not too great, much better than the grain. But when the acreage is large, or the object sought in the crop is to secure the greatest amount of fodder possible, with a certain amount of grain to give it quality as well, then it is impractical to attempt to harvest the crop by hand. Here is where the corn harvesters come into use. The greatest objection I have to their use in fields that are planted to obtain the largest amount of grain, is that they knock off too many ears. Some years this is worse than others, and very likely the variety of corn will make some difference.

Although the cornstalks furnish a large amount of valuable feed if properly cut and cured, yet it is one of the easiest crops to be damaged in securing. Over the larger section of our state, care must be used in selecting varieties in order to get those that will produce a fair crop and yet mature before there is a likelihood of a killing frost, for when the plants are frozen in the field before they are matured nearly all of the fodder and much of the grain value is injured.

If I do not get to talking on my subject soon, my time will be up. As a considerable quantity of the corn crop of the State will likely be cut by hand for some time to come, let us consider the best time to cut and shock. As most of the corn crop that is cut by hand is planted with the object of getting the largest amount of ears, it should not be cut until the grain is sufficiently matured.

When the corn is well dented and fit to be shocked, the fodder will have changed in color to some extent. Now is the time to thrust in the sickle, which is one of "Armstrong's" great machines. There is one thing to be said in favor of hand-cutting, and that is, when enough, and the right sort of help can be obtained, the fodder can be cut and secured in better shape than when cut with a machine; and when the corn is checked, if the help understands the trade, it can be put up about as quickly—all things considered.

As a rule, it is best to put up in good-sized shocks, eight rows one way, by nine the other, seventy-two hills each is a good size. Where the hills average from three to four stalks, and the field has been kept fairly clean, and the corn is not badly lodged, a good man will average ten shocks an hour. One advantage in cutting by hand is that when the field is not composed of the same kind of soil throughout, and the corn does not ripen evenly, hand-cutting enables the farmer to go into the field whenever he wants to, and cut as fast as the corn ripens. When cutting by hand, tie two hills together, and then set up the stalks equally on all sides. Set up each arm-full as straight as possible, and try to keep equal amounts on both sides of the shock at all times. Thus if corn is taken, one side will brace and hold up the other. Do not cut in a circle around the shock, but cut some on one side and then some on the other. By starting at the shock and cutting four hills out and then turning and cutting four hills back to you, have a good sized arm full, and in this way you have four arms' full on each side of the shock, and no time is lost in walking about empty-handed.

In binding the shock, use either corn-stalk or pigeon grass, whichever is handiest. Be sure and bind as near the tip as possible, and pull it as tightly as you can. Loose binding is the cause of many shocks falling down and thus damaging much of the fodder.

When harvesting with the machine, the corn should be cut at the same time as if cut by hand. With machine-cut corn, a good rule is to allow the bundle to lie on the ground for a day or two before setting up. This enables them to dry out to a considerable extent, and they are easier to handle. In setting up, first set up five or six bundles so that they brace each other in good shape and then tie the tops together, and set up the rest of the shock evenly around these. In binding, use the same care as before, and bind securely around the top.

When the crop is intended principally for fodder the planting, both in regard to time and thickness, should be different than when the object is to obtain the greatest amount of grain. It is not necessary to plant early, as the crop is often cut before the plants are ripe. In fact, in the Southern two tiers of counties of the State, it is best not to plant fodder corn too early that is intended to be shocked and fed as dry fodder during the winter. The reason of this is that if it is planted early in the Spring, it will be ready to cut about the first half of September, and usually at this time the weather is warm and usually we get a rainy spell soon after, and if the corn is set up in large shocks some of it is apt to mould on the inside and the grain will spoil some on the outside.

I prefer to plant fodder corn later, and then it will not be ready to cut until about the last of September, or the first of October, and by this time the weather is cool, and there is no danger of its spoiling in the shock. The only danger or risk in this practice is an early frost, which is something we rarely get in the Northern part of the State.

Corn planted especially for fodder is usually cut with a machine, as it is very slow work to cut thick planted corn by hand, and as the ears are smaller they are not as easily broken off. In setting up this fodder corn use the same method as spoken of before. Be sure to leave it on the ground a day or two before setting up.

If the corn is to be husked by hand the work can begin soon after the crop is cut, while if it is to be husked with a machine it will be necessary to wait until the fodder dries out to quite an extent. When husked by hand it should be done when the fodder is a little moist. The leaves will then not break up and fall off as they are apt to do if the weather is quite dry. The stalks dry out much faster after they are husked than before, so that if one wishes to plow the corn land in the fall the husking should be done early, and if the corn is too soft to crib throw it on the ground when husked and leave it in the field for a few days.

In those cases where the corn is to be husked with a machine and the fodder saved for feed—as it should be, it will be necessary to wait until the stalks have lost considerable of their moisture, as the shred fodder will not keep if the stalks contain too much water.

If the farmer wishes to plow his land in the fall, in most cases it will be best to draw the shocks up to the barns and put them up in small stacks to cure out, and shred after plowing. Some years the fodder is so slow in drying that it is not safe to shred more than enough at a time to feed the stock for one week; while in other years a shredded mow or stack will keep in fairly good shape all winter.

All of these methods are good when the weather is all right to cure the fodder properly. But the right sort of weather to preserve corn-fodder in the field is the exception and not the rule. Now to get around the weather I propose to tell you of better way. That is the method of preserving the fodder in the silo. The corn crop is acknowledged by all to be the ideal crop for the silo, and the silo is believed by most all dairymen—and many of the best stock feeders, to be the best place to secure the crop. Here it is stored where rain and snow will not corrupt, and where the stock will not break through and steal.

When the crop is intended for the silo it should be planted about twice as thick as when the object is to secure as large an amount of grain.

When it is to be stored in this way it should be harvested just when the grain is starting to dent, and the lower portion of the stalk is beginning to dry. Corn for the silo should be cut with a corn harvester, as the bundles handle so much better than loose stalks. Draw it to the feed cutter as soon as possible and put it immediately into the silo. When the silo is properly built, and care is taken in filling, nearly the entire crop can be saved in this way.

The three main essentials for securing good silage, are properly developed corn; cut at the right stage of maturity; and properly packed and distributed in an air-tight silo. When selecting varieties for a silo take the largest varieties that will mature in your locality in the average season. Plant it about twice as thick as you would if you were planting for the largest yield of grain.

I see that I have spent all of my time trying to tell how to save 30% of the crop and said very little about the 70%. Well that is human nature. We leave the "ninety and nine" and go to seek for the one that is lost. As a rule, farmers know how to take care of the grain. If the season is such that the crop matures, very little of the corn is lost, and if the cribs are built right the corn will keep almost indefinitely.

DISCUSSION.

Mr. Hill: I want to suggest an improvement in shocking by hand. I think the great improvement over that is to use a horse, I don't mean a machine with four legs, but one with two legs, a wooden horse.

Mr. Scribner: I had a neighbor who planted one patch broad cast and it should make excellent feed for cattle one would think, but although there were lots of leaves on it his cattle wouldn't eat it. After that he drilled his corn and his cattle would eat the whole of it. The difference was that the sunshine which Mr. Convey doesn't think so much about, had a better chance on the drilled corn, while the other where the sunshine couldn't get into it so well was not palatable. You take a stalk of sugar cane and if it is not in just the right condition, it wouldn't taste like much of anything. A little later on, when the sun gets into it, it tastes all right. I think we want our corn plot laid out so we can get all the sunshine we can.

Mr. Stiles: Mr. Convey thinks you get just as much sunshine no matter which way you plant it. He lives in a hilly country, you live in a level country, and there is the difference. The thing I always want is to plant so as to get the longest rows; I would like to have my rows eighty rods long, if I could, because I can cultivate so much better.

Mr. Underwood: The gentleman recommends cutting about seventy-two hills in a shock, nine by eight, and in cutting into shocks of that size, he figured a man would shock ten shocks an hour. That would be ninety shocks a day.

Mr. Stiles: No, a hundred.

Mr. Underwood: Have you got any men in your country that will cut a hundred shocks a day? If you have, I wish you would send them down our way.

Mr. Stiles: We don't keep them very long. Of course, we do not stick to the ten hours a day, but that is possible where you walk right along. Most men will run around the field a good deal of the time, but if you cut four rows down and four up, you have got an armful all the time. I will admit, if the corn is full of weeds, that could not be done.

Mr. Underwood: We are using the sled in our country with a horse, and that is giving a good deal of satisfaction. The sled goes between the two rows.

Mr. Stiles: That will work all right with standing corn.

Mr. Scott: I cannot quite agree with Mr. Stiles about leaving that corn on the ground two or three days. In case of rain you are pretty sure to have some corn injured. Again, Prof. Moore spoke this morning of the fact that considerable matter goes into the corn from the stalk. I believe that if that corn is put at once in the shock before those blades have become wilted in the sun, you will get a better quality of corn. That used to be true of wheat, when we cut wheat and shocked it we got a plumper berry than where we left it to ripen, and I think the same thing is true of corn.

A Member: I think if Mr. Scott had set up as much corn as some of us have, he would be willing to have it all wilted.

Mr. Scott: I believe I have set up as much corn as you have, although I have lived up in the northern part of the State.

Mr. Stiles: Of course if it happened to rain, it might damage the corn to a certain extent, although corn fodder does not injure as hay does. In regard to its absorbing from the ground and injuring the corn that way; corn does not work that way, but you take good heavy corn fodder running eighteen to twenty tons to the acre, and set it up, if it is murky weather, it will spoil to a certain extent inside the shock. If the bunches lay a day or two on the ground, they will dry out again, and when you set them up, they are stronger, stand up better.

Mr. Convey: I want to enter a kind of a protest here. If this report goes out, outsiders will think that we cut corn by hand, and believe in those small shocks. I wouldn't consider a shock made of nine hills by eight hills, more than about half a shock; I would build it fully twice that size. That is the way I make my shocks, and I never have had it spoil even when I shocked it up when it was raining. When you cut corn fodder it wants to be properly matured, and that can be readily determined by the color of the corn, it takes on a light green color and when it is ready to cut, go in and cut with a team; don't fool away your time by cutting by hand. It doesn't pay any more.

Mr. Stiles: That is all right, but you go to the northern part of the State among those stumps, and you can't go in with a harvester. You will find a whole lot of men that object to raising corn crops to put into the silo, or to putting up a silo, because they say we have got to have a corn harvester. I say it is not necessary to have a corn harvester. I say, go and buy a harvester if you have a yield large enough to justify it, but I think I am justified in recommending the cutting of a corn crop by hand when you haven't enough land in corn to call for buying a harvester.

Mr. Convey: I want these people to know that they should have a harvester and do the same as civilized people are doing everywhere.

Mr. Scott: We take out the stumps before we plant corn in the north.

Recess till 2 o'clock P. M.

The Convention met at 2 o'clock P. M., same day.

The Chairman: This afternoon we have a program to be opened with the subject "Wisconsin Potatoes."

I named a few of the things this morning upon which Wisconsin stands in the front rank in agricultural production, and I could have included potatoes, because we are right at the fore in the potato industry.

We have with us this afternoon a gentleman who, for years, grew seed potatoes for one of the leading seed potato houses in the West, and I now take pleasure in introducing to this audience Mr. L. E. Scott.

WISCONSIN POTATOES.

L. E. SCOTT, Stanley, Wis.

Mr. President, Brother Farmers of Wisconsin, Young Men of the Agricultural College, and Ladies,—It is to be remembered that the subject of corn this morning was divided into four different parts and four men handled it. This big heavy subject of Potatoes is assigned only to one man, but I will say that I have made no attempt to cover this entire subject, and as was the case with the other speakers, I have reduced what little I have to say to writing, and I shall depend upon you to draw out what I omit, in discussion.

Did you ever order a baked potato with your lamb-chop and await with anticipation the coming of a well rounded, thin skinned tuber that would break into a white floury mass upon the slightest pressure between thumb and finger, only to be disappointed when the waiter brought you a thick shriveled up, crusted skin from which you are only able to dig from the middle a little dark viscuous material better suited for the knife of the glazier than the stomach of the epicure?

Who's to blame? As in most cases, probably more than one. Possibly you were late to your meal and the potato was overdone. Maybe the fire was too hot. Probably the dealer in mistaken solicitude for his customer has purchased only those varieties that have a white, smooth and greasy skin, when he should have known that varieties with a crinkly or rusty skin, or one that is a little cloudy in color, are as a rule of better quality. Then I am almost sure that the grower is one of the culprits, and if he is not guilty of other indiscretions, it is safe to say that he has planted his potatoes too late in the season for the crop to become well ripened up before the blight kills it.

Would you make a pie from a green pumpkin? A frost-bitten pumpkin can never ripen and while an immature potato may harden up somewhat in the hill after the tops are killed, the starch is still in a gelatinous mass and the cells can never be nicely broken up by cooking.

VARIETIES.

The great market varieties in Wisconsin are still of the Rural type, including the Rural Number 2, Carman Number 3 and

Sir Walter Raleigh, all of which were originated by the late E. S. Carman, who, at the time he gave these contributions to the public, was the editor of the Rural New Yorker. Hence the names Rural and Carman.

While a few may dispute the assertion. I believe that nearly all concede the fact that varieties will run out in time, owing to that inevitable law of nature that every live thing, while it may be improved for a time, must later experience its decline and finally its death, and can only be reproduced from its seed.

The potato we plant is not the seed but merely a tuber, a continuation of the old life. All renewal of life and improvement in breeding must come from the tiny seed, which grows in the seed ball upon the vines.

In some localities, it is reported that the Rurals are showing less vigor than formerly and I believe the time is near at hand when the market must seek newer varieties.

CARE OF SEED.

Seed stock should be kept cool and dry. Potatoes that are badly sprouted are worthless for planting. If they cannot be kept dormant till planting time it will pay to spread them upon the floor of an outbuilding or upon racks built for the purpose in single layers. The little short leafy sprout slowly produced in this condition will do no harm and for early potatoes is a benefit.

SOILS AND PREPARATION.

Soils must be well drained, naturally or artificially, and to produce well should be deep, rich, and be kept full of vegetable matter.

Stable manure will do no harm if supplemented with green manure, that is green clover or green rye plowed under.

If potatoes are planted alongside of corn, a young clover sod plowed down in the spring will answer fairly well. Or they may follow corn in the rotation, by sowing rye upon the corn stubble at the rate of three bushels or more to the acre, after the crop has been put into the silo, and plowed under just previous to planting in the spring.

The fermenting of this green matter in the soil causes an acidity that is death to the scab and will insure a smooth crop.

I know of one experience where potatoes have been grown on the same soil continuously for twenty-three years by manuring every second year and sowing rye every year after the potatoes are harvested. Of course I do not recommend this practice but I am sure it could not have been as successfully done had it not been for the rye.

CUTTING SEED.

Under average conditions, a medium sized potato cut crosswise in four chunked pieces or about two ounces to the piece is as near a rule as can be given.

Do not cut long in advance of planting if it can be avoided. If unavoidable, store in barrels only partially full or in small boxes open only at the top. Never store in bags. Exposing too much to the air by shoveling over upon a floor is also harmful.

PLANTING.

Depth of planting will depend upon the drainage of soil. If well drained, five inches and level culture is to be recommended. Late potatoes may usually be planted deeper than early ones.

However they are planted, always leave a ridge over the row for a week at least. When the weeds are nicely germinated, this may be scraped off and the crop will come up clean. A few harrowings after they come up, and frequent fine, shallow, and continuous intercultivation will keep the crop clean and thrifty.

SPRAYING.

Two or three applications of Paris Green put on at the rate of 1½ pounds to a kerosene barrel full or 50 gallons of water, applied as soon as young bugs hatch will prevent ravages from the beetle.

The damages from the blights are lessened by spraying from three to five times with Bordeaux mixture. Five sprayings in nearly every instance gives better results than a lesser number.

When bugs are present it is better to put on the Paris green with the Bordeaux mixture. The lime in the Bordeaux counteracts the caustic effects of the Paris green upon the foliage. It holds it better in solution, resulting in a more even distribution, and the tendency is to stick longer to the leaves than when applied alone.

Will it pay to spray for blight? Let us first consider what blight is. There are two kinds of blight. Disregarding the Latin names, they are called in common English, the early blight and the late blight. Why they are so distinguished I never could quite determine for in this state there is little difference in dates of attack. Either disease may be looked for during the latter part of August. Possibly in the east the difference is greater.

The early blight is first noticed in the form of spots upon the leaves and the novice might easily mistake it for the burning of the leaves by an overdose of poison or for the blasting effects of hot drying winds which are often experienced at that time of the year and which hurries its development. During moist and cooler weather, the progress of the disease is slower and it may be a month before the plant is entirely dead, although it has become so weakened that the tubers make but little growth.

This form of blight is present, nearly, if not every year, and cuts down our yield and possibly injures the quality although no rot accompanies this disease.

The planting of weak seed, poor soil, bad cultivation, attacks of insects, dry weather, caustic effects of Paris green, or anything that weakens the vitality, renders the plant more susceptible to the attacks of this disease. To some extent therefore, we may prevent this disease without spraying.

Not so with late blight. This is no respecter of the vitality of plants. It does its work quickly. It comes in the form of a downy mildew and may be readily seen on the under side of the leaves and along down the vines.

It may be looked for in moist, lowry weather. The entire leaf turns black and hangs limp. The whole hill is as once affected and unless there is a change in weather conditions it will go over an entire field in a day or two. A sickening odor accompanies it. Rains wash the spores down to the earth and the tubers that lie near the surface rapidly decay. If the potatoes are dug at this period, the infection extends to the whole bin and all are lost. It is far better in such a case to defer digging till rotting has ceased and the spores are all dead and dry, when the sound potatoes may be stored in safety.

Notwithstanding statements that it does not exist in this state, I have known this disease for many years and have experienced losses from it at infrequent intervals.

It was quite disastrous in localities in 1902, 1903 and 1904. Thorough and frequent sprayings with Bordeaux mixture will in a measure prevent the ravages of this disease. It must be remembered that its use is preventive rather than remedial and if we could anticipate a severe attack of blight no doubt we would all spray. Spraying will probably prolong the life of the plant any season and result in an increased yield. Experiments all show this, but whether this increase is sufficient to warrant spraying every year is the great question that growers have long considered.

Bordeaux cannot be successfully applied with a whisk broom or with a rose sprinkler. It must be forced in the form of spray by compressed air or by direct pressure of a pump. The small hand sprayer and knapsack sprayer are slow and bothersome, and I don't believe it will pay to fuss with them. It is still questionable in my judgment whether it will pay the small grower to spray against blight unless he can hire a neighbor who is rigged for it to do it for him, or if he is a dairyman or fruit grower he may need an outfit to whitewash his stable and to spray his fruit trees. In that case it needs but inexpensive attachments to make the machine practical for an acre or two of potatoes.

Seventy-seven field experiments in New York. covering an area of 823 acres and distributed through a period of five successive years show an average increase in yield of approximately 43 bushels per acre. This last year's experiments show an increase of 30 bushels per acre.

Experiments in our own state for four years show an increase of about 33 bushels per acre.

Potatoes may be sprayed upon a commercial scale, five times during the season for five dollars per acre, and as this includes the spraying for bugs, which a grower is obliged to do anyway it would seem conclusive that it will pay the commercial grower to spray also to prevent fungus diseases.

ESSENTIALS IN A SPRAYER.

It is necessary that the pump and all working parts be of brass. It is far better if the air chamber and tubes are also of brass for the sulphate of copper used in the Bordeaux is very corrosive and a small rusty scale from an iron part will clog the spray nozzle and cause annoyance.

The best valves and hose and spray nozzles are none too good.

A good agitator is important and a back pressure valve should be provided so that when a certain pressure is reached the liquid will flow back into the barrel. The pressure in this may be regulated by a thumb screw so that the spray may be made wide or narrow to suit the size of vine. Sprayers with a galvanized steel tank, and the gravity sprayers, or those without a force pump depending upon the weight of the water alone, should never be purchased. The latter are not sprayers at all but only common sprinklers and are unsatisfactory.

OTHER POTATO MACHINERY.

The commercial grower should have a planter, and I like those planters best that handle the seed the most carefully even if it requires a boy on a rear seat to regulate the drop.

A digger also is a profitable tool while more attention should be given to the sorter. It is an inexpensive tool and is a great labor saver. The one which appeals to me most is an endless apron mesh which takes the potatoes from a hopper and elevates them into a bag, handling them very carefully and permitting the operator to pick off with one hand those unmarketable tubers that will not pass through the mesh.

I still hold that the most economical way potatoes can be handled from field to nearby storage or to the sorter is in bushel crates. But if they are to be hauled any considerable distance from storage to market it is better to use sacks owing to the weight of the crates.

Again I plead with you to plant early enough for your potatoes to ripen. If you spray for blight it will be necessary to plant earlier than otherwise, as the spraying will prolong the life of the vine and in case of late blight you want to be sure that all spores are dead and dry or your crop will rot worse in storage than if you had not sprayed.

DISCUSSION.

The Chairman: You have a wide field for discussion here; it is Scott's field, and you have got the fence wide open. We wish the young men here would ask questions, don't wait for these old fellows to do all the asking.

A Member: Mr. Scott said to plant early. How early?

Mr. Scott: I like to plant about the 15th or 20th of May. I have planted potatoes in June and it is a very common prac-

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tice, especially by our commercial growers, to plant late to avoid one crop of bugs. With our large power sprayers, it is but a small matter to spray for that crop of bugs, and we will get not only a larger field, but a far better quality by planting early enough so that the crop will be well ripened.

A Member: Are you troubled any with the scab?

Mr. Scott: No, sir, for the reason that we keep our ground full of green vegetable matter. That will, I think, settle the scab question.

Mr. Scribner: Suppose it does not settle it, is there any other way?

Mr. Scott: Of course, you can kill the scab on the potato by the use of corrosive sublimate or formaldehyde; that will kill the scab in the seed, but not in the soil, and it is very apt to be there.

Mr. Scribner: How long will this scab live in the soil?

Mr. Scott: Six or eight years. I think that was proved by Prof. Volley of North Dakota. He found that sowing beets on ground that had had potatoes on six years previous to that crop, his beets were affected by scab, so it will remain through any ordinary rotation, and the same scab will affect beets that affects potatoes, so he proved by that experiment that scab will lie in the ground six years.

A Member: Will a potato digger pay if you have help to fork them out by hand?

Mr. Scott: Yes, I think it will, if you are growing potatoes on a commercial scale. Better use your help for other things. Milk a few cows with that extra help.

A Member: How far apart are the rows?

Mr. Scott: About a foot and a half. You will notice I have advised pretty large cuttings. I would rather have a little larger field seed and plant one in a place, one foot in the row. The rows are about four feet apart.

A Member: How many eyes on the seed?

Mr. Scott: That is not so material as to have the proper amount of plant food there to start that young shoot. Anywhere from one to four. That is about what you will get when you cut medium sized potato in equal pieces.

A Member: Are potatoes good on corn land?

Mr. Scott: If you sow this corn land to rye, and plow that under in the spring, you can grow a good crop of potatoes, and your land will be then in good condition to sow to small grain, seed down without plowing.

A Member: How many bushels to the acre of seed?

Mr. Scott: Fifteen to twenty.

A Member: Might it not be possible to get too much of that manure mulch?

Mr. Scott: I think not. I am sure it is not possible in heavy clay soil. It might be possible in sandy soil if you allow this to become hard and woody before you plow it under and have a dry season, but if you plow it under as it begins to shoot, I don't think it is possible to get too much in any soil.

A Member: In black soil?

Mr. Scott: Yes, black soil, too.

A Member: Do you advise hilling potatoes?

Mr. Scott: Not much if the land is sufficiently well drained to permit of a fair depth of planting. If you are planting four or five inches and have your land well drained, then I would not hill very much; possibly ridge it a little the last time through. But if you are obliged to plant shallow as where you have heavy, soggy soil, then of course you hill, because those potatoes must be covered to protect them from the sun.

A Member: What kind of an instrument do you prefer to cultivate with and how deep do you cultivate and how often?

Mr. Scott: Of course the first cultivation is that of the harrow, but we are using for a cultivator the Planet Junior, No. 7, sulky cultivator. That has a good many attachments, but I prefer for most of the cultivation the fine teeth and a good many of them. I sometimes follow this with a Planet Junior walking cultivator, with thirteen teeth, and that makes very fine, nice cultivation.

A Member: And how often do you cultivate?

Mr. Scott: Just as often as I can. Of course that will depend something upon other work that is pressing, but I would like to cultivate soon after rain, just as soon as the surface will break up in a friable condition, not while the ground is muddy or wet, but just as it begins to make a crust, and make a nice fine mulch there, and I prefer to continue this cultivation as long as I can get a horse through between the tops without material damage to them. Of course, if your ground is a little crusty, and you go in with your cultivator and break up that crust and break the roots too, it will damage your harvest, but if this cultivation is fine and shallow and continuous, you can cultivate as long as you can get through.

Mr. Convey: Name the best varieties, early and late.

Mr. Scott: That is a very hard matter. The earliest variety we have is that of the Triumph or the Stray Beauty. That is the earliest, but not of very good quality. The earliest we use is the early Ohio or potatoes of that kind. Of course that includes the Acme. Then we have for our own home use still the Crown Jewel, an old variety, but not quite worn out yet, of the Hebron type. That is a splendid potato for early summer and fall use. For late winter use, I don't know of anything better than the Sir Walter Raleigh, one of the Rural type.

Mr. Ames: In the matter of seed and the size of the piece of seed you are to plant, I suppose outside of your commercial planting you could handle your potatoes so as to consider eyes. In that case what number of eyes would you prefer?

Mr. Scott: I have sometimes split eyes and planted only half an eye. I remember one time raising eighty-four bushels from one bushel of seed potato. It was a bushel that cost me ten dollars, and I was anxious to do the best I could, and I gave it a very careful cultivation. I have seen many good crops grown from one-eye cuttings, but under ordinary cultivation, it is not safe. If the weather is very dry, those small cuttings will dry out more quickly than a larger cutting will, and if it is exceedingly wet, a small piece will rot more quickly than a larger piece, so I think it is unsafe to cut our potatoes quite so fine. From experiences that have been tried at our Experiment Stations, we find that the greatest net profit results from about one-quarter of a medium sized potato. They have grown larger crops from half potatoes, but when they deduct that extra amount of seed, the net profit was not as great as when they planted quarters.

Mr. Ames: On the average, what do you consider a good crop of potatoes from a commercial standpoint?

Mr. Scott: One hundred and fifty bushels. Now, don't put this on the record, but the average of Wisconsin was only eighty bushels last year.

The Chairman: Well, last year was not an average year, was it?

Mr. Scott: No, it was not. We have heard a good deal about the Waupaca potato district. I was up there in 1892 and they were growing larger crops then than they are today, and some of the buyers estimated the average crop only at seventy-five bushels of marketable potatoes. Of course they raise a good many fields that they get a hundred and fifty and two hundred bushels from, but when we come right down to the average it is too small.

The Chairman: What is the trouble?

Mr. Scott: The trouble is too many acres. It was then, and I think it still is. Let me say I would not under any consideration make it the greater part of my business on the farm. Potatoes are all right as a side issue in connection with live stock growing, dairying, and right up there near that great potato section of Waupaca, or Waushara county, a number of years ago, they turned over,—a good many of them—to the operation of dairying; they found they were impoverishing their soils by too frequent harvesting of potatoes, and today, those farmers on eighty-acre farms are carrying eight or ten acres in potatoes and the balance of the farm is growing crops for the dairy.

Mr. Scribner: We find it quite profitable to grow what we call "succotash." Might we not do that with potatoes, say, every other row with onions, and then the onions would furnish the moisture for the eyes of the potatoes.

The Chairman: I think Dean Russell will have to have that worked out at the Experiment Station.

A Member: How do you cut your potatoes, with a potato cutter or a knife?

Mr. Scott: Just at present, I am cutting with a knife. I have used the old Aspinwall potato cutter, which was unsatisfactory at that time, but I am told that now they have a cutter that does more satisfactory work than the old potato cutter.

A Member: I have used the new Aspinwall, and if you get used to it, you can cut a potato most any way, and I like it.

A Member: What do you consider the ideal place for keeping seed potatoes?

Mr. Scott: An out-cellar, or better, a building that is frost proof and just fire enough to keep it dry. Potatoes have to keep dry as well as cool.

A Member: Did you ever pit them?

Mr. Scott: Yes, I have pitted potatoes and I have had potatoes sprout badly in the pit. If you pit potatoes, you want to raise the cover over the potatoes so there will be an air space over the potatoes. If you have the cover right down on the potatoes, as I have known them to be, even when the ground was frozen over, I have known them to heat and sprout badly. I have had an outside potato cellar that I used to store potatoes in with very good results, until I found that potatoes kept in that way will produce far better results in planting than potatoes that have been kept in the ordinary house cellar. There is a great deal in keeping our seed in good condition, and as has been said, it will never pay to plant potatoes that are badly sprouted, their vitality is lost.

The Chairman: We will have to close this discussion. The next topic announced upon the program is that of the Farmers' Wood Lot, something that certainly should not be neglected as it has been too long neglected, and we do not intend to neglect it, because we know it is an important topic. You have read in the papers that Wisconsin has secured the Government Forestry Experiment Station, to be located here at Madison. Then you probably read later that a Michigan Congressman got busy and the matter was held up with some chance for it to go to Michigan. Of course Wisconsin could not sleep under those conditions, and a Wisconsin Congressman, I understand, got busy, as well as other people, and our State Forester, Mr. E. M. Griffith, made a quick trip to Washington and the Wisconsin Wood Lot will have to be neglected a few days while he is looking after things down there. Of course we are all praying anxiously that we will get that wood lot, including the salaries to take care of it. At any rate, we will have to excuse Mr. Griffith today.

The next topic for the afternoon is another of those things that I might have included this morning in naming the list of things in which Wisconsin is taking the lead, and that is the great question of the eradication of tuberculosis from our herds of cattle. No other State in the Union, I am safe in saying, is doing anyway any more work than Wisconsin, along this line, and this afternoon this work and the work of the Live Stock Sanitary Board is to be presented to us by Dr. M. P. Ravenel of Madison, and it gives me great pleasure to introduce to you Dr. Ravenel.

THE WORK OF THE STATE LIVE STOCK SANITARY BOARD.

DR. M. P. RAVENEL, Madison, Wis.

Mr. Chairman and Gentlemen: Just why I should have been asked to give this talk this afternoon or just why I was so foolish as to accept the invitation, when there are many men here much better fitted to do it than I, I am unable to explain, but as long as I am here, I will try to show you something of what has been done, not only by word of mouth, but also by actual illustration by lantern slides.

The State Live Stock Sanitary Board of Wisconsin was organized in 1901, and its purpose was to take care of the live stock industries of the State of Wisconsin.

I expect it will astonish a good many of you who have not thought about it carefully, to know what the live stock industries of Wisconsin amount to. The dairying industry alone in Wisconsin amounts to something like fifty million a year; the only State in the Union which surpasses Wisconsin in its dairy product being the great State of New York.

Now, from the census of animals which has been collected by Mr. True this year, we have the following figures: in the State of Wisconsin there are 545,604 horses; these horses being worth $135,059,135. There are in the State of Wisconsin, according to this census, 1,250,000 milch cows of the value of $25,640,000. In all other cattle, 762,944 head, worth $10,182,000.

Now, this looks like a distinct falling off in the numbers of "all other cattle" from the last census, and if the increase in milch cattle is to be taken as true, it does not seem likely that "all other cattle" have fallen off, so that these figures are certainly inside of the real truth.

There are also in addition to this 590,975 sheep and lambs of the value of $1,691,000.

Of swine, there are 604,136 animals worth $3,221,000, so that taking it at the inside figure, we have a total valuation of the live stock industry, leaving out poultry, of $175,775,000, for which the State Live Stock Sanitary Board is responsible, or at least it is the body which has charge of the health of these different animals, and must look after the contagious diseases of these animals.

The estimates made by some parties exceed this. Dr. Reynolds places the cattle of Wisconsin at 3,340,000, of course a considerably greater number than the figures I have just given you. Out of these Dr. Reynolds estimates that the milch cows alone reach 1,400,000, an increase of about 150,000 over the estimate as made by Mr. True's office.

We have two problems before us: First, there is the economical problem of contagious diseases in these different animals; and then there is the public health problem, namely, the occurrence of contagious diseases in these animals which are transmitted to man.

In the front rank of these diseases, not only from an economical standpoint, but also from a public health standpoint comes unquestionably tuberculosis.

We have also diseases of swine,—hog cholera, and swine plague, which are not contagious to mankind, and therefore do not offer particular interest from the public health standpoint, but from a commercial standpoint, great losses have already occurred in the southern part of the State.

I noticed in a former report of the State Live Stock Sanitary Board that outbreaks of hog cholera occurred almost simultaneously at quite widely scattered points in the State. At the present time the disease seems to be almost entirely confined to the southern part of the State and not to be as widespread as it was formerly. This I gather from a report made two years ago.

Of the other diseases, which are transmissible to mankind, we have glanders in horses. Within the last two years some very unfortunate cases have occurred in the State of Wisconsin, in people taking care of horses which have been affected by this terrible disease. However, never mind how widespread glanders is as a disease of horses, there is never any great danger of its transmission to large numbers of men, and there is never going to be an epidemic of glanders in man. While it is a very fatal disease in the human race, it is not a disease which will ever become as widespread as tuberculosis.

Another disease which is very terrible in its nature and does affect a considerable number of people at certain times and places, is hydrophobia or rabies, a disease which is kept alive in the canine species. Rabies also has a very distinct economical value, inasmuch as all domestic animals are liable to this disease. While none of the domestic animals fortunately, outside of dogs, seem to keep the disease alive by propagating it, yet all domestic animals, including poultry, are liable to it by bites from mad dogs.

Rabies is transmitted to mankind, sometimes from a bite of animals, such as horses and cows, but as an actual matter of fact, it is transmitted to man mainly by the dog; sometimes, especially in the West, from the skunk, and in the South from the fox, a number of deaths having occurred from all three of these sources. It may also be transferred to mankind from cats, but this is a more or less rare occurrence also.

As to the losses from rabies in this State since I have been a resident of Wisconsin, there has been one very extensive outbreak starting up in the neighborhood of Beloit, and running northeast through Janesville and Milton Junction. Last fall we had about twenty-five cases of rabies in that district sent in for diagnosis. The losses in cattle within the last month down in the neighborhood of Monroe have been five or six animals. all of which died on a single farm, one of which has proved to be rabies and the others are almost certainly rabies; but losses from the disease have not been extensive.

Another disease which we have just had a good deal to do with lately, is foot and mouth disease. I believe there has not been any severe outbreak in the United States for a long time, although a little bit of an outbreak, which has just occurred, has caused the United States Government to invest $100,000 in stamping it out. You remember Wisconsin quarantined against the disease some time ago, but the quarantine has been practically raised at the present time. Foot and mouth disease does not cause great loss in the way of actual death, as a rule, but it does cause heavy economical losses through depreciation in value. Foot and mouth disease is transmissible to mankind, and there have been reports of death among children supposed to have been infected from some of the cattle in this epidemic. However, it is not an exceedingly common thing in mankind.

Now, all these diseases come under the control of the State Live Stock Sanitary Board. The State Veterinarian is the executive officer of that Board, and charged with the suppression of these different diseases. Whenever in any part of the country an epidemic of disease is reported to the Secretary of the

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Board or to the State Veterinarian, an investigation is made in that particular district, and every step possible taken to prevent the extension of this disease.

There is a new disease, at least new for Wisconsin, which has made its appearance in Wisconsin, or at least has been recognized here for the first time within the last year.

This disease was first described by Johne, a great veterinarian of Germany, and later by Prof. Bang of Copenhagen. This disease is characterized by a persistent diarrhea, which is intermitting with periods of comparative rest it is, however, invariably fatal, there is no cure for the disease, and no treatment has given any help whatever for it. Its invariable end is the death of the animal.

The only thing to be done is, as soon as it is recognized, to take out the animal and destroy it, and disinfect the premises as thoroughly as possible, because Prof. Bang has shown that the disease is transmissible through food. Five or six cases have been found in the State of Wisconsin within the last year, the first having been recognized by Dr. Beebe. Then Dr. Alexander and Dr. Clarke have recognized other cases, and sent specimens in to the laboratory, where the diagnoses have been absolutely confirmed by the discovery of the peculiar bacteria in the deep layers of the intestinal tract.

Another disease which has given a great deal of trouble in the State of Wisconsin, and which has occupied the attention of the Experiment Station, as well as the State Live Stock Sanitary Board, is infectious abortion. The germ of this disease was discovered in the laboratory of Prof. Bang of Copenhagen. Prof. Bang and his assistant, who has since died, made efforts to produce immunity from this disease, but failed. However, we have the satisfaction of knowing that the cow herself usually establishes an immunity after two abortions have taken place, so that the disease, unless new cattle are brought in, works itself out as it were. When new cattle are brought in, the disease may keep up indefinitely. The disease may be absolutely restricted by perfect cleanliness, by injections and washes, and taking care of the animal. Any cow which shows signs of abortion should be immediately taken out of the stable, away from the other cattle, remembering that the cow that does not have a discharge is not dangerous to other cattle. If a cow is immediately removed, the stable is not infected.

These are some of the things, then, that the State Live Stock Sanitary Board is taking into consideration, and preparing to do work on.

However, up to the present time, there have not been sufficient funds given to that Board to go out and do a larger amount of work on these things which should be done, and the Board is asking this year for an increased appropriation, so that some of these things may be better taken care of in the future than in the past.

Tuberculosis, as I said in the beginning, is the disease which causes the greatest economical losses, and it is an economical scourge, the greatest that we have in the farming country at the present time, and it is also the disease which has the greatest importance in regard to public health measures.

Now, I will ask for some of the figures to be shown on the screen. There have been two ways of dealing with the disease in the past in Wisconsin; the Agricultural Experiment Station has put into the field a considerable number of testers, mainly students who have graduated from the Agricultural College here, and these, last year, did testing to the extent of 27,000 head of cattle in the State of Wisconsin.

Now, you have before you some figures showing the amount of that work done since it began in Wisconsin. You will see that in 1905–6 there were 5,842 animals tested by the Agricultural Experiment Station. One thing will strike you at once, that the tests by the Agricultural Experiment Station have shown better results than the tests by the State Veterinarian, and that is because the tests made by the State Veterinarian have been in herds that were suspected of tuberculosis or known to be tuberculous. You will also notice that the first tests made when this work was started in the State of Wisconsin, show a very much higher percentage of reacting animals than those made in later years. There are two reasons for that: First, because the total figures are much larger in later years, and give a fairer knowledge of the actual percentage of tuberculosis, and second, in early testing, heards suspected of being tuberculous were selected for the demonstration of this test. Taking these figures, you will see, combining the tests of the Experiment Station and of the State Veterinarian, that there were last year approximately

41,000 head of cattle tested in the State of Wisconsin, with 2,334 reacters, a percentage of 5.6 per cent.

Taking the total tests in the State of Wisconsin up to the present time, you will see that there is a percentage of affected cattle as shown by these tests of 8 per cent. And you will see directly, this is very unequally divided in the different parts of the State, for reasons which are perfectly obvious.

Now, the State of Wisconsin offers three options to a person whose cows are found to be tuberculous: (1) they can be turned over to the State Live Stock Sanitary Board, the State paying an indemnity of two-thirds of the appraised value. The maximum which any person can receive under that plan is $33.33. (2) They can retain the animals if they are of a certain grade, and raise calves from them after the method of Prof. Bang, substituting a healthy herd for a tuberculous herd. Some of you had the pleasure of hearing Prof. Bang describe this method in person last fall.

The third option is that the State Live Stock Sanitary Board slaughter the cattle, and the net proceeds go to the owner. Taking the amount paid last year in the State of Wisconsin as being almost exactly $60,000, we find that the average price paid to the owners of condemned cattle is approximately $25 per head. Sixty thousand dollars was paid out from the State Treasury, and $18,450 recovered by the State Live Stock Sanitary Board on the sale of cattle which were not condemned in their entirety, by the United States Inspectors at the houses where these cattle were slaughtered.

These animals were slaughtered under Government inspection and those which pass may be sold, for the benefit of the State, if the indemnity has been given in the first instance, or if they are sold for the net profits, the whole of it goes to the farmer, less expenses.

The next slide shows you diagrammatically a summary of the tests made by the Experiment Station during this period from 1905 to 1908, and the figures are self-explanatory. It shows the number of animals tested, the number of them which were affected with tuberculosis, also the same thing is shown by herds.

One thing which is very interesting is shown on this figure: the Experiment Station in conjunction with the State Live Stock Sanitary Board has carried out the practice of giving demonstrations, which show, not only what tuberculosis in cattle is, but also what the tuberculin test will do in showing up tuberculosis. In various parts of the State we find great variations. For instance, up in Barron, there has been a great demand for the test. You find extremely varying conditions with respect to the number of tests. Up in Superior and Douglas counties you see much work has been done.

Of course the number of tests in the southern part of the State are out of proportion to those in the northern part of the State.

Now, taking the number of milch cows in the State as $1,250,000, it is estimated that it will require something like thirty years at the present rate of testing to test all those cattle.

Now, I say this for two reasons, first, to show you not only what a problem there is for the State of Wisconsin to get rid of this disease, but also to tell you what is before us to be done in the future, and the great problem which confronts us.

Just at the present time, the Attorney-General of the State has rendered an opinion that no testing can be accepted for an indemnity, except that done by some person authorized by the State Veterinarian. This has put a temporary check on testing by the students of the Agricultural College. However, the Board has passed a resolution following that opinion of the Attorney-General, by which examinations are given by the Board, and after passing these examinations, the student will be authorized to carry out this test, by the State Veterinarian. On successful examinations, there have been up to the present time thirty-five men licensed to do this testing. This testing comes up against the State Veterinary Practice Act, which includes tuberculin testing, and the veterinarians have to a certain extent objected to these men doing this testing for pay.

There have been introduced already into the Legislature several amendments to this bill, one of which meets with the approval of the State Live Stock Sanitary Board which will allow men who are not registered veterinarians to charge for this work. This bill also, according to the conference that we had yesterday with the man who introduced this act will put this matter into the hands of the State Live Stock Sanitary Board, leaving with them the power to reject or accept any person as a tester, whether that person may or may not be a registered veterinarian. All students who have had any education in the matter, who take this examination and pass it satisfactorily, will be licensed by the State Veterinarian to do this testing, and will be allowed to charge for it if the bills pass.

We have in the State of Wisconsin something like three hundred and fifty registered veterinarians, a number totally inadequate to carry out the testing which is demanded in the State. Dr. Clarke has estimated that if we were to license three hundred and fifty or four hundred students, we will be able to get through the bulk of this testing within the time prescribed each year. For instance, if we are able to put out seven hundred testers and they are able to get through with twenty-five head of cattle a day each, the total testing of the State can be accomplished in something like two and a half months. That is a pretty high estimate for a man, to accomplish that right along, but I simply give you these figures to show you the problem that is before us, and how near we can come to handling it.

I do not doubt myself, if these bills go through, that we will be able to handle this problem satisfactorily in the State of Wisconsin.

As Mr. McKerrow has already told you, the State of Wisconsin is further advanced than probably any other State in the Union, in this tuberculosis work, and the only proper way to handle it is to take hold and push it while much of the State is new, and not thickly populated with cattle.

They say in New York that the herds have increased in tuberculosis to such a terrible extent, and the economical problem is such a vast and overwhelming one, that there is hardly anybody brave enough to go up to the State Legislature and say, "You must go ahead and clean out these four hundred thousand cattle which we know have tuberculosis." It is a very great problem, but we know it has got to be handled sooner or later, and the State of Wisconsin, with the great advance it has made through the Experiment Station, in conjunction with the State Live Stock Sanitary Board, is in position to handle this question, and keep it going.

I may say we have now got the disease on the run throughout the State, and we intend to keep it on the run as far as it lies in human power.

Our new bills have been framed after consultation with the leading live stock men of the State; I believe that every important Live Stock Breeders' Association and Cattle Association in the State has been consulted and represented at these consultations, and these gentlemen, in consulation with the Board, are unanimous in upholding and advising these laws to be passed.

You have before you another chart, showing the extent of tuberculosis in Wisconsin, the upper figures showing the number of animals affected and the lower showing the number of herds. Of course the number of herds affected will always be greater than the number of animals, because if you have a herd of fifty cattle and one single one is affected with tuberculosis, that herd is put down as affected.

This chart suggests the question: When you wish to renew your herd or increase it, which is the best thing to do, to get a new animal which has been shown to be free from tuberculosis, or to get an animal from a herd which is free from tuberculosis? The answer is perhaps not obvious at first sight, but experience in New York has shown that it is a dangerous matter to fill in your herd with individual cattle which do not react to tuberculin from a tuberculous herd; that the best thing to do is to buy cattle from totally free herds. If individuals are bought from tuberculous herds, they should be put in quarantine and retested before the new animals can be put into your herd. If you can get animals from a tuberculous-free herd, it is better than buying individuals which are free on the test, but which came from a tuberculous herd.

This next chart shows the difference between the northern and southern parts of the State in regard to tuberculosis, and the reason for this is so obvious, it hardly seems worth while to go into it. The black lines represent the southern part of the State; the red lines represent the northern two herds of the State. This solid line shows the number of animals and the dash line the number of affected animals. You can see without any explanation that the southern part of the State is very much more widely affected than the northern. This is an old dairy section whereas in the northern part of the State there are not so many cows, and the herds are newer, conditions are not favorable to tuberculosis to the same extent that they are in the South.

Now, this is another diagrammatic way of showing how tuberculosis is spread in Wisconsin. Here from the herds tested, 1562, there were 363 herds affected, and out of the 363, 263 were infected by the purchase of diseased animals, a tremendous proportion. Of the 363 infected herds found there, 263 were infected by the owner of that herd buying in diseased animals.

Here is a very obvious lesson; look out for what you buy if you are going to put new cattle into your herd. By all means depend upon the tuberculin test. Be sure you do not bring home a snake and warm it in your bosom, and then have it sting you, be sure that you buy only healthy cattle.

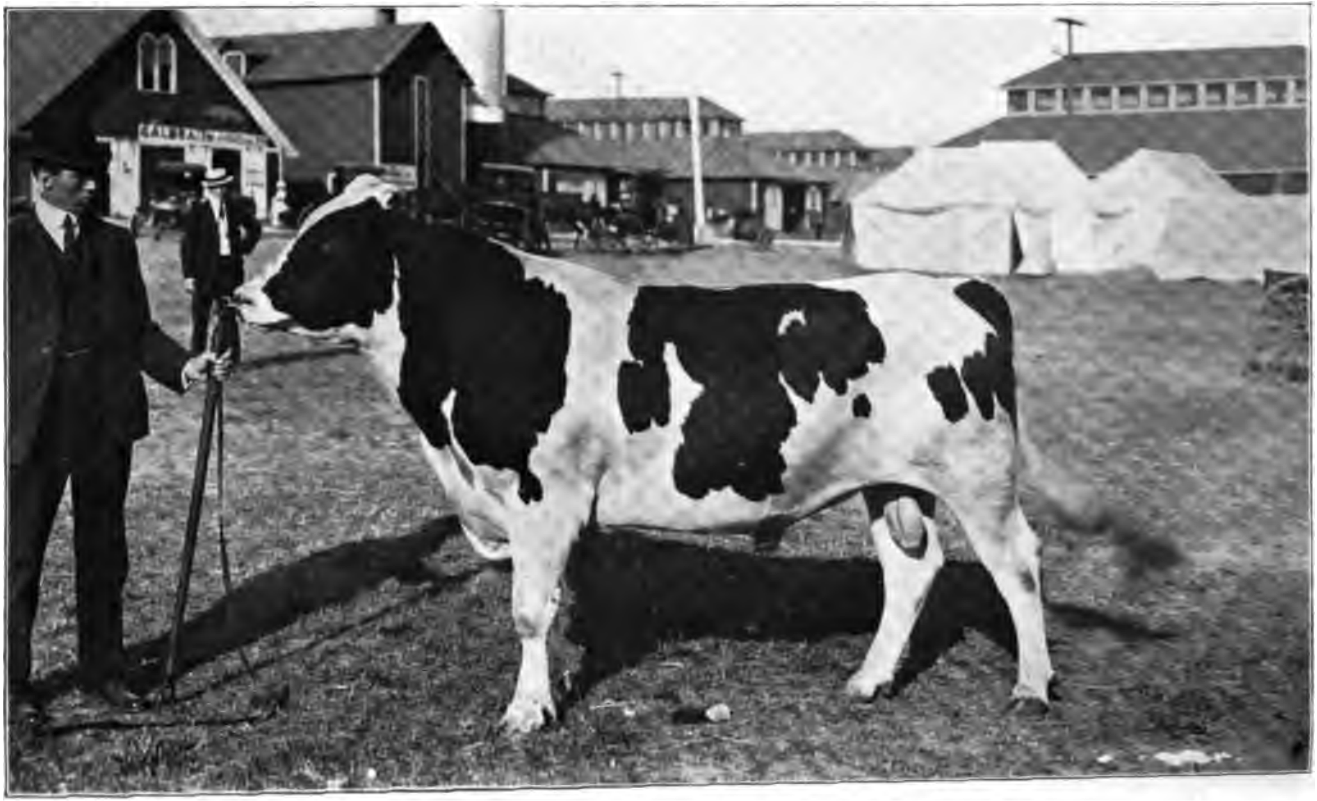
This picture shows you an instance of a dispersal auction sale. This farmer died and the herd was sold at a dispersal sale. Thirteen farmers bought at that auction sale, and twelve of them brought in diseased animals, only one escaped. This man only bought two and one of them was diseased. The fellow over here, this poor farmer, every single animal he bought was diseased. This is a striking instance of how the purchase of diseased animals spreads tuberculosis in the State of Wisconsin.

This picture illustrates another great danger we are exposed to in the State of Wisconsin and in all States. Here you have the Oak Park creamery and here the Medina creamery. You may have a perfectly healthy herd, and three or four of your neighbors around you may have perfectly healthy herds. However, one neighbor who may be at some distance from you, may have diseased animals. You carry from your neighborhood your milk or cream. Then you carry away from your factory the by-product, the skim milk, and feed it to our stock, and here is the result, or here was the result in this case. All of these red dots represent tuberculous animals in these herds and they affected all the product of that factory, and spread the disease through the sending home of the factory product which contained tuberculous milk. Perhaps one single farm did this; we can't prove that, but we can say with perfect safety that a single infected farm in a district will result in spreading that disease to every farm using that creamery.

These are the two great ways in the State of Wisconsin by which the disease is spread, and we hope to put some restraint upon these methods of spreading disease if we can put through the bill now pending in the State Legislature.

This, ladies and gentlemen, ends the lantern slides that I have to present to you, and I think it covers all that I ought to say.

All these tests have shown that tuberculin, when properly used, is almost infallible for the detection of tuberculosis in



A Young Prize Taker.

cattle, and it is the only safe way we have of discovering tuberculosis in cattle.

I thank you very much for your kind attention and will be glad to answer any questions.

DISCUSSION.

Mr. Ames: What was the second option? The first was to accept two thirds of the appraised value, and the third to accept the net value?

Dr. Ravenel: The second option was, if the cattle were of a certain grade, they may be retained in quarantine according to the Bang system, and the calves raised from those diseased cattle; because healthy calves can be raised from diseased mothers by separating them at birth and feeding them on pasteurized milk, or the milk of healthy mothers. That is the Bang system, gradually changing the diseased herd into a perfectly healthy herd, and it has been wonderfully successful in Denmark.

A Member: In the different diseases, dangerous to man, you did not name anthrax?

Dr. Ravenel: Anthrax was accidently omitted from my list although I had it on my notes. It is a most dangerous disease spread from animals to may by inoculation. There is no danger of its ever becoming epidemic in mankind. Human cases occur almost always through accidental wounds of the skin but in some places those working with wool and hair are infected with pulmonary anthrax by inhaling the spores. We find the disease in veterinarians, knackers, butchers, tanners, brushmakers, etc. No case has been reported in the state of Wisconsin for the past two years.

Mr. Cunningham: How does a cow act when she has hydrophobia?

Dr. Ravenel: A cow that has hydrophobia shows a number of symptoms. There are two types of hydrophobia, which you see in cows, as well as in dogs, namely, the furious type and the dumb type, or the paralytic type. In the furious type the cow is very nervous, and in all cases there is a watering from the eyes, the cow will look off into space and make a sudden charge, and if you go toward her or raise a stick in your hand, the cow will charge you, and sometimes become perfectly furious. The Marquis of Bristol lost four hundred deer of his preserves in England from hydrophobia. They suffered from the dumb type showing very few symptoms, until they became paralyzed and fell down and died.

A Member: Is there any danger of transferring tuberculosis through milk or butter to mankind?

Dr. Ravenel: There is a tremendous danger. Since that question has been asked, I will go into that for a few minutes. Prof. Koch, who discovered the tubercle bacillus, in his first work, showed that the diseases were the same, held they were the same, and that there was this danger from the milk and butter of diseased animals, and he held that view until 1901. Then he gave out the statement that human tuberculosis could not be transmitted to cattle,—a statement easily disproven. He said that if the cattle disease was ever transmitted to man it was so rare that we need not take any account of it. Following Prof. Koch's announcement, the German government appointed an Imperial Commission, which was under the control of twenty-five of the leading professors of the German Empire, including Prof. Koch himself. That commision has made several reports, showing that in children 25% of all cases examined by it were due to bovine tuberculosis. The English government appointed a Royal Commission, and in their reports they show that 23% of all the cases examined by them were due to the cattle germ.

A collection of all cases of human tuberculosis which have been carefully studied to determine the source of the infecting germ, gives a total of 306 cases of which 63, or about 20%, were due to the cattle germ. The absolute demonstration of the danger to human beings from tuberculosis in cattle was first made at the laboratory of the State Live Stock Sanitary Board of Pennsylvania, where we found in the abdominal organs of a child the cattle germ. Further examinations at this same laboratory have discovered some five other cases. The Bureau of Animal Industry in Washington, and Dr. Theobald Smith of Harvard have demonstrated the same thing. Febiger and Jensen of Copenhagen in 7 out of 12 cases found the bovine germ, and in several of these were able to trace the infection to cattle with tuberculosis of the udder.

There can be no question in view of the facts brought forward by workers in practically every part of the world that cattle tuberculosis is a serious menace to mankind. The chief danger is through milk, but the germ may be found in butter and in the meat.

At the recent congress in Washington we had a conference on this subject at which Professor Koch was present. The facts were made so hot for him that he showed very bad temper, got red up to the roots of his hair, turned to the audience and said, "I have never denied the possibility that cattle tuberculosis could be transmitted to man." It is, however, true that Koch's statement made in London gave this general impression. Perhaps the increase in the death rate from intestinal tuberculosis which has been shown by many workers in Germany and other parts of the world is due to carelessness brought about by the weight of Koch's authority.

A Member: Why haven't we all got it if we are all handling these tuberculous cattle for years?

Dr. Ravenel: Not so very long, sir. It is practically a new disease in cattle. I wonder if you have any idea how many people have actually got tuberculosis. There are one hundred and fifty thousand peope die of it in the United States every single year and at the very least calculation, that means over a million people traveling around this United States with consumption. In Wisconsin we have about 2,500 who die every single year of consumption; that means at least 10,000 to 12,000 going around the State with tuberculosis.

A Member: Well, Professor, I live in a manufacturing city, and there are ten times as many people die of tuberculosis in such a city as you will find out in the country.

Dr. Ravenel: That is very probably true, but every one of those peope drinks milk, you must remember. If you will go to any city in the United States, you will find that milk is the most universally used food. Understand me, I am not pretending to say that all those cases of tuberculosis are due to milk,—I don't believe that myself,—but when a man has got consumption it doesn't make any difference where he got it, he then becomes a focus of infection for all of his neighbors, and when a man from the country gets the disease, or carries the infection to the city, he acts as a focus of infection to his fellow workmen.

I say most unhesitatingly that tuberculosis in cattle is the cause of a considerable amount of disease in mankind and is a danger to everybody.

A Member: I don't believe it, for all that.

Dr. Ravenel: If you will give me proof to the contrary, I will accept it and I will say I am wrong.

The Member: Doctors always disagree.

The Chairman: Our friend here is a little like an old Scotch friend of mine, who, when I said to him in an argument, "There is no use to discuss it with you, because I can not convince you, you are not open to conviction," he said, "I am open to conviction, but I would like to see the man that can convict me."

Dr. Ravenel: The gentleman reminds me of an old Scotchman who always wanted to raise a kick about everything, and he was a clergyman, too. He had a visiting clergyman preach for him one day and in the prayer, this visiting clergyman said, "Oh, Lord, please look down with special grace on our aged and infirm pastor, who is on the road to the grave, and has but a short time to remain with us, and when You see fit to remove him, take him to Your Heavenly Kingdom." And the old man was so mad, he got up and said, "I won't go."

A Member: Where did he go, I wonder?

The Chairman: I think he went to the Legislature.

Secretary True: If the discussion of this subject has been finished, I would like to say just a few words, made necessary by the opening remarks of Dr. Ravenel, where he quoted figures from the census of our office. I want to say, not so much for the benefit of the audience, as to put the matter in our published report in the right light, that the Doctor is correct in saying that these figures are very conservative.

These figures are gathered by the assessors at the time they make their annual assessments. They report to the county clerks, who report to our office, and I find that in a great many instances, especially in some counties, there has been a gross lack of care in reporting these statistics. This year I went to the trouble of comparing these figures reported to me with the reports for assessment and taxation purposes in the several counties, and corrected my statistics as given, as the Doctor has them from these combined reports, and still they are conservative. They show a strong increase in the number of milch cows over last year.

The number and value of swine and sheep as given by the Doctor is decidedly low, much lower than they will be shown in horses and cattle. I merely want this to go into the report to show that if our statistics are not to be credited, that we are not to blame for their condition, but that the blame rests back of us, and with the assessors of the several counties of the State.

Recess till 9:30 A. M., next day, Thursday, February 4th.

The Convention met at 9:30 A. M., Thursday, February 4th.

Mr. McKerrow: Please be in order. I shall call to the chair this morning to preside over the discussions of the forenoon a member of our Board and one of your well known institute conductors, Mr. L. E. Scott of Stanley, Chippewa county.

Mr. Scott: It is an inspiration to me to see this fine body of young men. It means so much, it impresses one with the greatness, the grandeur of the future of our already grand and great State of Wisconsin.

Talking to your Dean last night, the remark was made that we had just begun here in Wisconsin. Of course we are in the lead, we believe it, we feel it, but there is so much more to do that comparatively, we have just commenced along agricultural lines. The southern part of the State of course is pretty well developed, but when we look out at the great expanse of good land in the northern part of this State, we wonder whether we have any conception of Wisconsin's future, agriculturally.

Now, we want to get right down to the business of the morning, and the first subject of the program is that of production of swine. We have with us this morning a man that needs no introduction to the younger members of this audience, and yet who has had a large experience upon one of those great large farms in Northwestern Wisconsin, Grant County, and still has been your instructor here. He is not only theoretical, but has had a practical experience. I am glad to introduce to you Mr. John L. Tormey, who will talk to you upon Swine Production.

PRACTICAL SWINE PRODUCTION.

JOHN L. TORMEY, Madison.

Before entering into the main discussion of this paper, I deem it somewhat advisable to give a few introductory remarks upon the early history of swine in America, not only to show the different factors that have been instrumental in building up the paying type of hogs we have today; but also to throw some light upon economic conditions which have conspired to place the production of swine in the rank of a national industry.

Although perhaps not bearing directly to any great extent upon "Practical Swine Production," it is interesting to note that the introduction of swine into America was undoubtedly coeval with the introduction of the peolpe and as each section along the Atlantic coast was colonized, we learn that hogs were introduced as an article of food. The first swine were undoubtedly brought by Columbus in his second voyage, but the first hogs in America were introduced in 1538 by the Spanish, and we find the English bringing swine to Virginia in 1609. These hogs we understand were not bred wisely and consistently as we think we are doing to-day, but were allowed to run at large and reproduce at will.

The Revolutionary War marked—as in all our industries—an epoch in the swine industry. As a purely American production. the hog here received his first impetus; but the hog was the last class of animals to receive attention from the improvers of live stock.

Railroads were then unknown and the means of transportation up to 1850 were limited. Corn was becoming popular as an agricultural plant, and the people naturally began to cast about for some means by which the crop could be cheaply conveyed to a market. The hog soon showed his ability and usefulness in converting the crop into pork, and at the same time in being able to carry the carcass to market. Naturally, the early type would be a large-bodied, muscular, long-legged, traveling hog; but people were not long in discovering that this hog was a slow developer. It took two, three, or even four years to mature them. and the meat was coarse, tough, and scarce on the carcass.

The natural outcome was that about 1800 the people were anxious for a change and about that period we find our first attempts at improving the type of hogs, when the Duke of Bedford sent three hogs to General Washington. The hogs are described as a splendid breed; fine in their points, of deep, round carcass, short legs and thin hair. They kept easily and matured early; were light of offal; and the meat was of first quality. At about this time there were introduced the Chinese, Spanish, Norfolk, Lincolnshire, Leicestershire, Hampshire, English and Irish Graizer, the French, the Swiss, the German, the Neopolitan, the

Russian, the Calcutta, and various other breeds. The paramount item of interest here perhaps is to note that at that time the reformers had our modern idea of a profitable type well in hand; the time was ripe and environment only was necessary to develop the type.

A striking and peculiar feature of this early day breeding was, that none of the breeds were kept pure—they were crossed and intercrossed upon one another and upon the common stock of the country. The farmers at that time seemed to view the breeding of hogs as an experiment. Baltimore and Philadelphia had, at that time, quite well established markets, and the hogs was becoming more and more a factor in industrial circles. The time was then at hand for more systematic work in its breeding and development.

The period from 1830 to 1840 was one of the most important in American swine breeding, and importations of improved stock were frequent. The block, however, is the final test of the worth of meat, and without an outlet for consumption and a strong central market to supply a constant demand, there would be no call for extensive pork production and no demand for systematic breeding. So about this period we read of shrewd buyers driving hogs long distances to market, and allowing them to graze and grow fat *en route*. The demand for a market nearer the center of production drew the great packing business then in its infancy, from Baltimore and Philadelphia to Cincinnati, and we read that in 1841 over 250,000 hogs were slaughtered there. Many of them were exported and in addition 12,000,000 lbs. of lard were put up there, worth nearly $500,000. We may correctly assume that at that time Cincinnati was to 1840 what Chicago is to 1900, only of course on a diminutive scale.

The constant growth of manufacture, and the improvement of transportation facilities, caused a centralizing of the population in the great cities. This population had to be fed and the food must necessarily come from the soil in the most condensed form. Hence, the beginning of the real swine industry.

A glimpse at the Chicago market alone will serve as an index to the stupendous industry which has evolved from the work of the one time humble swine herd.

In 1900, Chicago's meat product reached a valuation of $256,527,949, or 32.7% of the total value of the annual meat valuation in the United States. February 10, 1908, 87,716 hogs were handled in one day; in one week ending Jan. 11, 1908, 302,070 hogs were received; in the month of January, 1908, 1,179,233 hogs were received and in 1898, 8,817,114 hogs were received. The Union Stock Yards, made famous by the hog industry, now consist of over half a section of land. The property is now worth over $10,000,000 and the capital invested in and around the yards in slaughtering amounted to over $67,000,000 in 1900 and the men employed numbered over 50,000. There are over 200 acres of yardage, 20 miles of street, 20 miles of water troughs, 75 miles of drainage and water pipes, and 150 miles of railroad track within the limits of the Yards.

There has been in the past half century a steady consistent growth in the demand for pork. This demand has steadily reflected upon the supply—both increasing means an increase in capital involved and an increase in wealth to producer and packer. Without this lucrative compensation no industry can stand as such. In view of the great money gains in swine production we can hope for nothing but a steadily growing industry for swine producers.

The value of swine to the producer, and the returns expected therefrom depend, of course, upon: (1) The man backing up the proposition. As in all other industries and callings no man can expect results worthy of mention unless he be a man of sound judgment and have a knowledge of his own business. Any industry or occupation is above a man without character, but no honest labor is beneath a good man. The success or failure of any project must of necessity depend upon those engaged in the work.

(2) He must also have a knowledge of the market classification of hogs if he expects to become successful, and his success will be measured largely by the dollars and cents cleared up.

The Chicago market divides the receipts into a great number of classes, but for convenience we will classify the market hogs (and let us bear in mind right here, that the hog industry is an industry, because of the money made from the commercial hog to go directly to the consumer and not from the raising of breeding stock) as:

1. Butcher hogs (common; barrows and prime hogs: heavy)
2. Packers (inferior, piggy, etc.)

3. Light (bacons, inferior in size and quality)
4. Prime heavy hog (almost extinct)

1. The majority of hogs which go to market may be ranked as butcher hogs. As a class they are mostly barrows and a general average puts their weight at 225 to 250 pounds, although they may range in weight from 180 to 350 pounds. A few good young sows may go into the drove without detracting from value. As a general statement we may say that our fed shotes ranging in age from 8 to 10 months are butcher hogs. There hogs as a *general rule* are most in demand, bring highest prices on market, and are commonly used for dressed meat trade. Extreme range in price for 1908 was $4.00 to $7.50 per cwt.

2. The packing hogs range in weight from 200 to 500 pounds and differ greatly in quality from the butcher hogs. They are poorer in quality and in this class we find our inferior stuff such as old breed sows, and other hogs not good enough for butcher stuff but heavy enough for this class.

Where the butcher hog has been sent along at a good rate toward the finish, the packing hog may have suffered setbacks and we find that, weight for weight, the packer is usually the older hog, not having the quality to turn feed into money as readily as does the butcher hog. Due to scarcity, prices were good the past year and ranged from $4.00 to $7.60.

3. Light hogs *in general* include all hogs ranging from 125 to 220 pounds in weight. This class includes bacon hogs ranging in weights from 155 to 220 pounds. Light mixed weighing from 150 to 220 pounds and light pigs and hogs weighing from 100 to 150 pounds or even lighter than 100 pounds.

The majority of hogs sent to market the past year were light hogs, due to the high price of corn. This explains to a certain degree how it was possible for the Chicago market to handle the extraordinarily large runs and also how the price was kept up in the face of such record breaking supplies. The idea is that a certain total number of pounds is necessary and the lighter the hogs, the greater the number that is necessary. Prices for 1908 ranged in extreme from $4.00 to $6.85.

4. Prime heavy hogs range in weight from 350 to 500 pounds, and are a type so nearly extinct on the Chicago market as to almost warrant our not mentioning them. Time was when barrows were not sent off as shotes, but were kept over until they were over a year old and carried good fat backs and clean bellies

of fat. The demand on the market for a lighter hog and the desire on the part of the producer to turn hogs into dollars as quickly as possible has put the prime heavy hog out of the running.

Besides these classes there are also runts, stags, and government "throwouts" not worthy of consideration in practical production.

Besides a knowledge of market classes and conditions, the successful swine producer must early fall upon some type and breed and stick to that type and breed, if he wishes to get the steadiest returns from his swine producing operations.

By breeding either pure breds or high grades of some particular breed he can almost bank upon a consistent and constant profit. An outcross is always dangerous; although increased litters are often the result, we often sacrifice quality and type—the two important factors in determining market value. Then again we find that after our second outcross we obtain almost a nondescript and all our efforts at grading have availed us almost nothing.

The Chicago market does not discriminate either in favor of or against any breed of the lard type, but it does discriminate against white hogs and mottled nondescripts, claiming that a white skin is always associated with a white coat and that the white skin is more susceptible to disease; but commission men do advise selecting a certain breed and becoming familiar with it, because the greater and more intensive the knowledge concerning one breed, the more successful will be the producer.

To be a successful producer of swine the man must have a knowledge of the market, as the time of marketing means either loss or gain in the season's operations.

The producer ought to know something about:

(1) When to market,

(2) Some of the more important factors influencing market values, and,

(3) How to market.

In discussing market types we learned that the most approved hog on the Chicago market was the butcher hog of about 225 pounds to 250 pounds. Now we hold that a hog should have a pound of weight for every day it has lived, and so our butcher hog is generally a shote about 8 or 10 months old. The majority of these shotes throughout the country are farrowed about

April and May and come upon the market as the best quality hogs from Dec. 15 to Feb. 1, every year as an average. We also find our old sows beginning to come to market about the last of October, so that every year we note a dropping in price from about Nov. 1 until February. Along about the last of February, we note a rise and in April, May and June we usually have good prices. The same is true in September when we usually have our highest prices. The fall shotes are then all sold off, the sows that have failed to breed have gone in, the young pigs are keeping cheaply, and are too young to ship, and the old sows have not yet recovered their lost flesh. Feed at this season is comparatively cheap on the farm, old corn is almost all gone, and the new crop is still an unsafe proposition as feed.

As a growing proposition there is nothing more profitable than the spring pig. Every day is getting longer and sunnier, the grass is getting better, and the pig is getting stronger. The fall shote which would strike a better market and is a good adjunct to both the steer and dairy industries, is rather a precarious proposition, but if dropped before Sept. 1, and provided with good bed and shelter he can be made to win out at a good profit by consuming what would otherwise be injurious to our brood sows and by landing on an up market.

Then again if the pig could be farrowed earlier, run onto feed and weaned as soon as possible, the old sow could be got into shape, and sent to market in October before the majority begin getting onto the market. Of course the factor of feed again enters in, the farmer does not like to keep his corn too long as it is good business ethics to turn your crops into cash or the equivalent as soon as possible.

There are several factors influencing market values. The most important factors are supply and demand in spite of the fact that the big packers are being constantly accused of cornering and controlling the market. The supply, of course, is a variable, depending primarily upon the hog crop and disease; but scarcity and cost of feed may rush them to market, and following a rush we get a decline. The demand is controlled to a great degree by prosperity. Meat is what might be termed a necessary luxury and in hard times the laborer cuts meat off his bill of fare about the first thing. The packer has a harder time controlling the pork market than any other market due to the ease with which pork can be slaughtered and every year we read of more and more "down town" and home butchering being done. A splitting up of the demand due to competition prevents cornering.

The prices of other meats are a factor in controlling the price of pork. When beef and mutton are cheap, pork must necessarily drop in price as the demand then turns toward the cheaper meats.

The price of feed also controls to a certain extent the cost of production and thus has quite an influence on the price of pork. The higher our price of corn, the higher must our price of pork go, and statistics show there is a more or less constant ratio between corn and pork prices. When corn is high the people sell corn and supply that demand, but in doing this, they tend to cut down supply of pork and raise its value and the rule works both ways.

In any industry the money made is always the surplus over and above cost of production and expenses, so that the raising and keeping down expenses are matters of consideration almost as important as striking a good market.

When it comes to the question as to how to market, there are two general methods, viz., selling to a local buyer and shipping directly to the large market. The first method has as perhaps its strong argument the fact that the producer knows just what he is going to get for his hogs and what his year's profit will amount to. Then again, the strain of speculation is eliminated.

But in spite of the above, we maintain that the better method is for the farmer, if he have enough hogs for a load, and if not, for a number of farmers, to cooperate, pool their interests, and ship on their own responsibility, and to accompany the shipment. Of course, we admit the shipper or middleman does not get rich at his business, but year in and year out the producer will win out with a little more money on the long run. Not only that but it puts the farmer upon a plane with a man of the world, and takes him away from home, which is often a good thing. He has the opportunity to see what other men are doing, gets new ideas as to doing things, and above all, he gets an insight into the system of classifying his product, and gets some wisdom as to what his product is really worth.

We know of several instances of communities where farmers have cooperated and where individual shipping is done—some one or more of the owners accompanying the shipment and the custom is growing—where once tried it is not dropped.

The American hog has well been termed "The Mortgage Lifter," and to the swine industry as such our nation owes much of its present flourishing agricultural condition. The stock farm, without argument, surpasses the grain farm, and the men who have advanced along agricultural lines have been improvers of live stock.

Hog raising has given to the farmer:

1. A quick cash return for the feed without robbing the farm soil.
2. The highest return on labor and capital invested in any branch of the live stock industry, and
3. A connection between the farm and the large markets, making the hog raising proposition not a physical drudge, but an industry calling for skill and thought.

To the nation it has given the distinction of being the home of the greatest meat growing and curing establishments in the world; and adds to the nation's wealth about $300,000,000 annually.

DISCUSSION.

Mr. Richards: At the price of grain and corn, can a farmer raise hogs and make enough upon them to pay for his labor at the market price of grain feeds?

Mr. Tormey: I think he can any time.

Mr. Convey: We have heard considerable about the bacon hog, I was very much surprised not to hear that mentioned in this fine paper.

Mr. Tormey: The Chicago market does not discriminate in favor of the bacon hog. I think you will find out that the best lard hog that has been sent from this Station cooled out about 87 per cent. We find our bacon hog cooled out upon the average about 10 per cent less. Now, if we send in our bacon hog in competition with that lard hog, you can see how the thing is going to line up, can't you? The buyer at the Chicago market will discriminate in favor of the lard hog every time. I think that as a general thing we will find that our lard hog puts on more gain for a dollar's worth of cost of production than does the bacon hog. There are perhaps two or three markets in the country, I think there is one at St. Paul, and there is a little packing establishment down in Ottumwa, Iowa, and I don't know about Jones out here, whether he discriminates or not, but those places do give a little premium on bacon hogs, but if we are not offered a premium on bacon hogs, we can't afford to raise them in competition with lard hogs.

Mr. Convey: While I am a producer of the lard type of hog, I wouldn't be at all certain that they are the most economical of production. Would not a straight bacon type of hog make a better type of pasture hog?

Mr. Tormey: It may be.

Mr. Cunningham: When you refer to bacon hogs, would you also refer to a certain breed as a bacon hog?

Mr. Tormey: No, sir, I am not referring to any certain breeds at all.

Mr. Houser: Do you mean to go on record as asserting that hogs can be produced at a profit at any time?

Mr. Tormey: What do you mean, from the time they are farrowed, Mr. Houser?

Mr. Houser: Oh, no, I mean with reference to prices and the price of feed that they consume.

Mr. Tormey: Well, of course, you have to take several things into consideration. I don't know whether I am very clear on that or not. Define your question a little more, I won't promise to answer it, anyway.

Mr. Houser: Can you produce and sell hogs at a profit when they are selling for five and a half cents in the local market and corn is worth 65 cents in the local market?

Mr. Tormey: Well, that depends upon whether you have to buy your own corn or raise it. A bushel of corn is worth just as much whether you raise it or buy it. At home we always buy corn. We have never sold a thing off the farm, except live stock during all the time we ran it, my father and I, down to the present, and that is almost sixty years. Of course, there is a question there, you find that in a good many neighborhoods they are selling off their corn when the price gets high, but I think that at seven and a half cents, you could probably make a fair profit on raising hogs if your early cost of production is not too high.

Mr. Scribner: I think that is one trouble; too many people are depending on the other fellow to grow the hogs. I don't think it is profitable to feed exclusively on what you grow on the farm. I am in the dairy business, and I cannot raise a profitable ration on my farm to feed cows, and I think it is the same with hogs. I think a man will make a profit in buying some mill feed, etc.

Mr. Roberts: In order to grow hogs profitably during the summer, you want to provide plenty of green feed, and in that event you probably can make a profit on five and a half cent pork and 65-cent corn, but if they have to be fed exclusively on grain or any other feed, an equivalent, the margin is too wide to make a profit.

Mr. Houser: I am sure that no intelligent feeder of live stock would advise the raising of hogs entirely upon corn and my question contemplated the usual manner of feeding hogs, of course, finishing them as you have to do it in order to reach the demands of the market in the proper way, with corn, and the building in of the marble.

The Chairman: And assuming that other feeds are in proportion.

Mr. Houser: Yes, assuming that other feeds are in proportion. There is a very great doubt in my mind whether any profit can be realized upon five and a half cent hogs when corn and other things in proportion are worth 65 cents a bushel.

Mr. Roberts: That is a point I wish to get at. Other feeds are equivalent in price, they are all high priced.

Mr. Houser: I want to commend the paper and to speak of it particularly in reference to the very live wire that it touches on the matter of marketing hogs; that is the meat in the cocoanut, and it raises some of the most stupendous questions that the farmers of America have to contend with. It is a matter that influences and controls profits. Even our great government is interested today in probing into the little things to find how it is that the price of hogs on hoof do not seem to harmonize or compare with the price of hogs on the hook. There is an influence in there that is not controlled entirely by the legitimate law of supply and demand; in other words, the trust enters into it, and that is a question for the farmers to think of.

Mr. Cunningham: Speaking of raising hogs, do you contemplate or have you in mind the raising of your hogs on grass during a part of the summer, or replacing that as best you can with the best intelligence you know how to use in feeding and care?

Mr. Tormey: I don't think you can run any interest on a farm without having sufficient pasture. The hog, as well as all other animals, needs pasture and shade and good, clean water. You hear about the hog being dirty: I think he is one of the most particular animals around the farm. He will appreciate every bit of cleanliness that you furnish him. I like to see a hog with plenty of pasture, good, clean running water, if possible, and plenty of shade, and if you are running a dairy farm, you have all the advantage in the world. The man that can't make money with hogs on a dairy farm better quit farming. The man that can't make money on hogs on a steer farm, there is something radically wrong with that man, I think, if he is attending to business.

Mr. Houser: Isn't it more appropriately a complement to the dairy farm than to the steer farm?

Mr. Tormey: I don't know, you can't make any money at all on a steer farm without hogs; you can do it with both on a dairy farm.

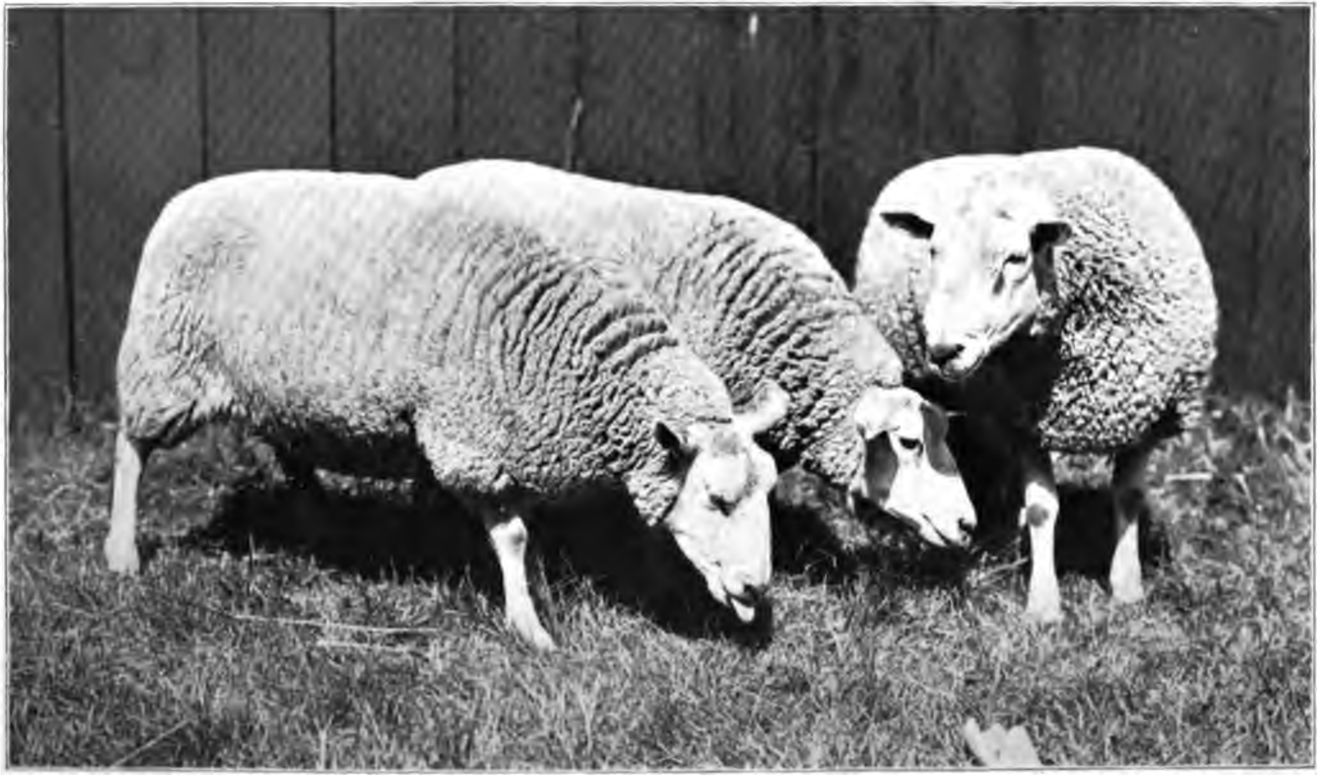
Mr. Convey: I think the strong feature of this paper is the advice as to marketing hogs at the proper season. We have to steer clear of the low market of hogs with high-priced grain. We must take advantage of the high market and market our hogs when we can get the value for the food consumed, and in that, there is always profit.

The Chairman: I was glad to hear Mr. Tormey say that although he is a young looking man, "we have been farming for about sixty years." Boys, that means something. Mind you, he doesn't say "I," but "we have been farming for about sixty years."

Owen Meredith, that great English writer in "Lucile," his highest piece of work and probably the greatest love story that was ever written, a story I used to read when I was many years younger, made a wonderful contribution to the literary world, a great deal of good philosophy, and I remember one thing is this,

"What to our sires was X Y Z is to us A B C,"

which simply means that we should profit by the experience of our fathers. Fortunate is that young man who has had a father who has been successful along agricultural lines. Twice fortunate is the father who has a son who takes an interest in his work



Cheviot Sheep.

as Mr. Tormey has in his father's work, and follows right along the line, associating himself in that work.

Now, we have another. You have been familiar with the work that Superintendent McKerrow and his son have been doing along the lines of sheep husbandry. They have not only become noted importers and breeders, who have done a great deal toward developing this industry, but have been in close touch with the industry throughout the State and farther, and I am happy at this time to introduce to you Mr. W. A. McKerrow, the younger member of the firm, who will talk to you upon the sheep industry in Wisconsin.

THE SHEEP INDUSTRY IN WISCONSIN.

W. A. McKERROW, Pewaukee, Wis.

The historical or evolutionary method has been applied to all classes of industries, institutions, plants, animals and man. By this method we may understand the factors entering into present accomplishments and conditions. Industries have come into existence contemporaneous with the development of new wants and greater ingenuity in man, demand giving use to production principally, but being partially created and assisted by production. Plants have taken on a wonderful capacity for variability under changes of environment and modification in treatment, and animals have been changed in character and differentiated in accordance with utility, or the purpose for which man has cultured them. Man has developed a wonderful social nature and a vast capacity for organization under modern conditions of dense population, and along with this has developed the intellectual and spiritual side of his nature above the physical. The study of this is highly interesting, but it is more than interesting; it is profitable. The continuity or indestructibility of evolutionary tendencies and processes or rather the appreciation and recognition of them is a light to the future in respect to which these industries and processes are studied. For example if modern conditions show a tendency for the development of mind, rather than muscle, the perfection of the mental ideal, spells success, for it is the type which assimilates most closely to the world ideal. This doctrine has its limitations. A sound mind requires a sound body and the idea otherwise expressed would be that the factor of mind organization or management is a bigger factor in general world activity or production than physical strength is. So much for example.

Modern sheep breeding is as much an evolution as any other industry is, and the study of its tendencies and changes should be just as profitable and necessary as the tendencies of any other industry.

It is plain in the first place that sheep breeding lends itself readily to this sort of examination. Our knowledge of the sheep business runs parallel with authentic history, for sheep breeding was the earliest of the arts. Abraham, according to scripture, viewed his flocks from his tent door. Jacob used the wool to make a coat of many colors for Joseph. We cannot alone glean general knowledge of the system of sheep husbandry followed and this is peculiarly easy as the pastoral system has remained practically unchanged even up to the present time. Our sheep in the mountain districts in their original state are practically the same as in early ages.

A study of the general features of the sheep business now and of old teaches us one important economic fact. In the pastoral age, sheep was almost the sole wealth—at least sheep or cattle. The business then was sole and general, so to speak. Agriculture, mining, and industrial arts, and the professions, were of no importance, dignity or extent, though we must concede them a beginning some place. The important thing to notice then, is, that sheep-keeping was the big industrial feature. Its use as meat is not its earliest one. It was then the instrument of wealth. This introduction may seem strange to you, under the topic, "Sheep breeding in Wisconsin," however. The realization of early conditions fixes by contrast, the condition of sheep husbandry, in national economy at present.

In modern times, sheep breeding is a much more limited affair, naturally speaking, than it formerly was. Sheep at one time answered most of the wants of sheep-keepers and of the total of pastoral population. Now the producer of sheep, as the producer of any other product is engaged in furnishing to the world of consumers products that go with an innumerable list of other products to satisfy complex rather than simple needs. His business is measured up on purely a commercial basis.

There is no special honor in having large flocks apart from the business prudence their owner displays in putting himself ahead. If there is anything to be said in favor of one industry as against another for honor, we should have to frame our conclusions in this way. This is a commercial and speculative age and our big men are the commercial and speculative men. Wealth used to be counted in sheep, but there are faster ways for the acquisition of wealth than by sheep keeping, so that sheep-keeping is not the road to the highest distinction.

This is an age of currency and finance and the financier has the call at present. Then we must find our place and fill it well.

General industrial and world evolution has differentiated and specialized men's uses and functions. We cannot longer be the whole thing but only a part of a complex whole, just the same as the organs of the body form one function of a complex organism, of the whole body. The whole organism and its well being, however, is involved sensitively in the perfection of each organ, as each organ becomes the subject of special care and study.

The general lesson to be learned from the contemplation of the specialization of world duties simply teaches us the need of specialization to secure perfection with respect to single industries. Sheep breeding is not only a single branch of specialization but each special purpose for which the product must reach is an individual branch. And we shall treat mutton production from the view point of the producer on high-priced lands. The rancher is a pastoralist and to some extent may be compared with the shepherds of Bible history, but the day of the old time ranch methods are numbers. There are greater possibilities in the cultivation of kind rather than numbers. This side of breeding is becoming more and more important as the art is developed.

Neither can the care and management be discounted for the making of special meat products is as great a factor as it is of blood. The need of intensifying is the most obvious of all aims with the producer of stock and this has always the two sides of selection and care, of which we will speak later.

We must therefore look for greater improvement in our flocks in the middle west. We have said time and again, the production of mutton is and will rest upon the farmers of the smaller farms of the middle west, our great grazing districts are being transformed from their dry and unthrifty state into veritable gardens through irrigation and cultivation, thus reducing the area populated with the shepherds and the golden hoofs. May we look with the mind's eye into Great Britain's fertile fields, hills and valleys, and ask ourselves, why these people, in all parts of that great country, are making the greatest success in sheep farming? Because of that specialization necessary for the highest development of mutton production necessary in intensely farmed districts.

Wisconsin is adapted to sheep husbandry in climate, soil, and nearness to markets. She stands without an equal in the quality of her pure-bred flocks. Sheep from this state have won more prizes at the greatest American shows in the past fifteen years than any other state in the Union. The University of Wisconsin has been more successful in the show ring with fat stuff than any other institution. The one great reason we do not have more high class flocks, is the lack of intelligent care, breeding and study, successful breeders must give to attain the greatest success. This does not mean, every sheepman should aim to produce pure-bred sheep for the show-ring but rather aim to produce a mutton carcass, fit for the highest class trade.

We find in the production of live stock of all classes, great stress is being laid upon the use of pure bred, registered sires. Wisconsin is waging war against the mongrel stallion because our best and most observing men see the effects on horse production. Could you imagine the great six horse teams of Morris, Swift and Armour being sired by mongrel stallions? Let us review the winning carloads of mutton lambs at the Chicago International and grand Champions, ever since the beginning of that show, and we find in every instance they were sired by pure-bred recorded rams of the down breeds. It is conceded that pure breds will give that uniformity in the lamb crop, with those feeding qualities not obtainable by the use of mongrel sires.

There is a difference in pure-bred sires. There are scrubs in pure-breds as well as mongrels. This the breeder should guard against, no matter how good the breeding without individuality we are working against odds. However a great many times, a well bred animal of poor individuality will reproduce much better than many mongrels. Let us follow the flock throughout the year, noting a few essentials in the care and feeding.

The beginning of the sheep industry is the lambing time.

Here is needed the wise skill and happy instinct of the shepherd, to know what to do and when. The ewe flock on entering winter quarters, needs the vigilant shepherd's eye. Exercise for the pregnant ewe is an important factor in producing strong offspring. The long walk, the exercising yard, old pasture fields or stalk fields, should be used every day before lambing, retaining strength and vigor in the growth of the young.

The ewe to be at the best, should be in good condition at time of lambing, some grain ration is necessary. We have found in our experience a mixture of oats, corn, bran and oil meal makes a good ration for the ewe, the amount depending entirely on the condition of the flock, and the coarse feeds being fed.

Our coarse feeds consist of clover and alfalfa hay and corn fodders. The alfalfa crop is our favorite for sheep feeding. We are growing it to a certain degree of success and believe in the future we shall be more successful by inoculating our soil, by sowing alfalfa with all our clover seeding from year to year.

For succulent feed, there is nothing can take the place of roots and some feed of this nature is profitable for the proper assimilation of other feeds in their dried state. The natural food for the animal is grass, and the nearer we can reproduce these food conditions, the better our flocks will thrive. In Great Britain, we find the average flockmaster feeding from five to twenty pounds of roots per head per day. This we cannot do, but a few roots are a profitable crop for the production of high class mutton, both for the breeding ewe and growing stock. However, we have in Wisconsin a feed which will act as a fairly good succulence, and the cost of production is much less. This is corn silage. This can be fed to the breeding flock, from 2 to 3 pounds per day with excellent results. Matured silage gives much the best results, with less danger of set back to the flock of overfeeding sour silage. The pregnant ewe, then, in order to obtain the best results, should have first of all, plenty of exercise, together with foods conducive to the growth of the young and proper succulence, later having a heavier grain ration at least two or three weeks before lambing time.

Other influences affecting milk production favorably or that may be made so as to affect it are heredity, form, and selection.

On the principle that like produces like, the ewe lamb, produced by a free milking mother descended from two or more ancestors in the material line that are also free milkers, is more certain to be a free milk producer than a ewe lamb chosen for retention in the flock simply on the ground of her individuality. Likewise the ewe lamb, the offspring of a sire, the progeny of a free milking ewe, and the immediate descendent of even a limited succession of free milking ewes, is more likely to be a free milker than if chosen without any regard to such descent, consequently when due regard is given to the milking qualities of the ancestry on the side of both sire and dam, in the ewe lambs, chosen for the perpetuation of the qualities, the results cannot but prove favorable.

The form of the individual would seem to be but little less powerful to influence free milk production than heredity. The matter of form has a great deal to do with these tendencies. I like to see a large capacious barrel, a head at least inclining to fineness, a fine neck, and small where it joins the head. Selection of the ewe then should lie along the lines mentioned, coupled with good care to give the best results.

Now let us suppose that the ewe has been selected and treated rightly, that she has been properly fed and exercised. She is strong and active at lambing time. She gets uneasy with the rest of the flock, goes off by herself, lies down and gets up. Then we must place her in a pen by herself, preferably away from the others in a quiet place, until the young lamb is born. Another time perhaps you will find the ewe has dropped the lamb in a cold place and it has become so chilled that it cannot suck. The thing to do is to take it at once to the house and plunge it all over in a tub of hot water, as hot as you yourself can endure. This will revive it quicker than anything else, wipe it thoroughly dry and when its blood is circulating well, give it some of its mother's milk. Care at this stage has saved the careful shepherd hundreds of dollars in currency with the satisfaction of having a greater percentage of production.

When the lamb attains the age of ten days to two weeks, we see it around the feeding troughs trying to nibble grain and hay. Have your lamb creep ready for it, namely, a small pen in a bright sunny corner of the barn, or if space does not permit, a high dry spot in the yard may be chosen. In this creep, we place a trough, about six inches high with a bar parallel with the trough about four inches above, to prevent the younster from climbing into it, as lambs will do. It is fed whole oats, each day. A small rack should have a place in the creep for the best hay harvested. Fresh clean food each day will profit the feeder. The results derived are apparent, not only at the time of feeding, but after weaning they will readily feed on the fattening rations.

One of the great difficulties in the sheep business in the intensely farmed districts has been the infection with internal parasites. In this, the farmer is largely at fault. In driving through our dairy districts the observer will note, sheep grazing on the old woodlot pasture, dried and burnt with the summer sun, and yet on the same farm, we find the dairy herd in a luxuriant growth of clover and timothy. Sheepmen or shepherds, if we can conscientiously so title them, are running their flock on these old pastures, the home and breeding ground of intestinal and lung worms.

We find it profitable in mutton production to keep our sheep on new seeding, especially the growing lamb. We find it an excellent plan to seed rape, in our fields of corn to be harvested for the silo, at last cultivation for fall feeding our market or breeding lambs after weaning.

Lambs should be weaned when from four to four and one-half months old, at this time the pasture as a rule is drying up. By weaning our lambs and putting them into the best, we can advantageously turn the ewes on the dry pastures for two or three weeks, until they have released the milk supply. The udders should be watched by the flock-master to relieve ewes with full udders.

The ewe flock, before the mating season, should be put on good feed. We find the flushing of the ewe flock an important factor, both in prolificacy and getting ewes with lamb.

The lamb flock is now on the best clover or rape pasture. A change is what they should have, when one is ready to feed for the market, the aim should be to feed lambs rather than mature sheep as the food part of the investment is used for growth and fat producing. Lambs will make better gains for food consumed than older animals. We here in Wisconsin should aim to reach the market when the western lamb is not over running the market. I earnestly believe the breeder and feeder makes a great mistake in marketing his lamb in a warmed up state. A finished product will always bring a much better price than one only started on feed.

In summing up the essentials for better mutton production, we note the selection of the sire and dam, here enters the question of prepotency, and its effect. It is an illustration of the law that like produced like. It is that law illustrating itself in what may be looked upon in the concrete form. Possessed in considerable degree by all pure bred animals, following a lineage of vigorous, prepotent ancestors.

Prepotency in dams is not so important as prepotency in sires. Nevertheless, it is true, that a dam, which transmits her own peculiar excellencies, is very valuable. When prepotency in both sire and dam are marked and in the same directions, then it is that animals of highest excellence are secured.

The care of the ewe flock and the young lamb with the object of making the greatest gains, in the least time at a nominal cost, should be our chief aim, together with quality. The production of early lambs, or easter lambs, has not entered into a factor in Wisconsin to any considerable extent.

As a man must shape his product primarily by demand, these must shape his actions by his circumstances and fitness to produce the commodity required, reconcile these factors with his tastes and finally put all his care and energy into the enterprise.

Though the sheep business is only a part of the vast whole of production, the cow produces milk and beef, and cotton competes with wool, and hams and bacon and poultry have been added to beef as his competitors in meat supply, this means the addition rather than reduction of incivilities to energy and ingenuity in sheep husbandry. Compared with the ancient shepherd, the modern one should be a walking encyclopedia.

DISCUSSION.

A Member: We would like to have Mr. McKerrow tell us if he considers mangels and beets good feed for rams and wethers?

Mr. McKerrow: Yes, we consider mangels and beets very good feed. Of course we consider the best root feed is the rutabaga, but mangels and beets are profitable feeds. We produce a considerable portion of the rutabagas, because they can be produced at much less cost than the Swedes.

A Member: Are they safe feed for rams and wethers?

Mr. McKerrow: No, not to a considerable extent. We have fed mangels to rams in very small amounts, but to feed in large amounts you will get bad results.

Pres. McKerrow: Does it make any difference when the mangels are carried over to warm weather of the succeeding spring after being grown, after they are woody in the center?

Mr. McKerrow: Yes, you could feed some more at that time, although I would want to be on the look out and not feed very much at any time.

A Member: How about corn silage for rams?

Mr. McKerrow: Yes, we can feed corn silage to rams, and if the corn is in the proper state of maturity when put in the silo, we can feed from two to three pounds, and a great many times a larger amount of that succulent feed to rams.

A Member: Does it have any effect on the prepotency?

Mr. McKerrow: No, it does not. We have not found any bad results and I haven't heard of any.

Mr. Hill: You say if the corn is put in at the proper stage. What is the proper stage?

Mr. McKerrow: We like to have our corn almost ready for the husking stage for sheep, and we also like to have our corn ensilage cut down and let the corn wilt a little bit before putting it into the silo unless you have a dry year and the leaves are dry to some extent.

A Member: Will the ewe take the lamb after it has been dipped in hot water?

Mr. McKerrow: Yes, as a rule. Sometimes we have a little trouble and sometimes we can help that by putting a little peppermint on the lamb and also on the mother's nose.

Mr. Roberts: Feeding lambs, those that you wish to carry over for breeders, you wouldn't feed them very heavily on corn?

Mr. McKerrow: We feed but very little corn if any. In turning young lambs out, we don't feed any grain until the pasture gets very short.

Mr. Nordman: There is one beautiful thing about the sheep industry Mr. McKerrow brought out very nicely, and that is that it is going to be carried on in the future by the small farmer. In the northern part of the State it has been tried by great aggregations of capital, and they have brought sheep in there by the ten thousand and they have proven a failure in almost every instance. The sheep industry of the future is going to be carried on by the small farmer, the man that has a small flock.

Now, there is one other point: that is in regard to summer pasture. It seems to me that where a man has a certain amount of land to devote to sheep pasture, the better policy for him is to divide that into two parts and keep changing about. We notice that sheep will graze on a particular part of a field while there may be plenty of grass in other portions. They will let that part go by, let it grow up and get hard and woody. If you compel them to eat down each part of it and then change off and put them on another part, the danger from worms is lessened and the sheep get much better feed.

A Member: Are carrots good feed for sheep?

Mr. McKerrow: Yes, they are a good feed, but the cost of production is really too high at the price of labor in this country to raise a profitable crop.

The Chairman: What is the cheapest succulent feed?

Mr. McKerrow: The cheapest succulent feed is corn ensilage; that is, the comparative cost, although I believe that the most succulent feed is the root crop for sheep.

Mr. Nordman: Then it is the cheapest.

Mr. McKerrow: Yes, it is the cheapest in the long run.

Mr. Nordman: At what age will lambs begin to eat?

Mr. McKerrow: We find they commence to nibble at ten days to two weeks old. We like to have our lamb creeps ready at that time so they will enter the lamb creeps and nibble the oats.

A Member: How would you treat a sheep that was infected with intestinal worms?

Mr. McKerrow: That is a pretty hard question to answer. We find a great many remedies on the market, but not many that are effective. We find a great many people use gasoline as a drench and some with success. I believe that taking your lambs in the spring of the year and keeping before them wood ashes and salt or sulphur and salt and continuously keeping your lambs on new pasture, is the best way to regulate the disease if you have it in your flock, but if you find in the late summer that you have the disease, I believe that a gasoline drench is the best remedy.

Mr. Nordman: Do you dip, and how often?

Mr. McKerrow: We dip on the farm once a year. A great many farmers find good results by dipping the lambs only about a week after shearing, but of course where you are getting new sheep on the farm, you have to dip regularly.

A Member: What season of the year do you practice shearing?

Mr. McKerrow: We shear in April, but of course it depends entirely on the man's conditions when he shall shear his sheep. I believe that the farmer, that is, the shepherd, the man that is taking good care of his sheep, should shear before his sheep go on grass, and if he is a shepherd, he will see to it and get these sheep in out of the cold spring rains off the pasture, but if he can't do this, I would advise that he do not shear until the cold spring rains are over.

Mr. Brigham: Will not the wool be lighter at that time, less grease in it, and won't the work of shearing be harder?

Mr. McKerrow: I don't think you will find very much difference in the weight of fleece; may be a very little but not much. If it is a flock that has been properly cared for, there won't be much difference. Of course, when they get on grass and they get to doing better, the fleece will be a little heavier.

Prest. McKerrow: Do you believe that you gain in the health of your lamb what you might lose in the weight of the wool?

Mr. McKerrow: It is best for the health of the lamb to shear early; that is, the ewe will do much better, and give a better flow of milk for the young lamb, if properly care for.

Mr. Roberts: You still have twelve months to grow wool.

Mr. McKerrow: Yes, as far as time is concerned, you don't lose anything.

A Member: Is there any danger of getting breeding stock too fat?

Mr. McKerrow: Yes, there is danger of getting your ewes too fat. You just want them in a good thrifty condition.

Prest. McKerrow: As you see the average Wisconsin flock, do you see them any too fat?

Mr. McKerrow: I should say not.

Mr. Scribner: Don't you think people very often confuse the words "flesh" and "fat?"

Mr. McKerrow: That is quite true.

A Member: What do you advise for a dip?

Mr. McKerrow: We have several good dips, and for the common sheep, take any of our coal tar dips or Cooper's, any of those dips are good.

A Member: In preparing a certain bunch for the show ring, do you allow them to run with the rest of the flock or do you keep them in a separate pasture?

Mr. Nordman: Mr. McKerrow isn't supposed to tell all that he knows about that.

Prest. McKerrow: I was just going to tell him not to tell everything.

Mr. McKerrow: I am quite willing to tell. You, of course, will have to take them from the rest of the flock. If you are feeding a bunch of six or eight, take them from the rest of the flock, possibly, the first feed, and start to feed them better and fit them on from that time, not confining them to close housing until later in the season. Finally, probably about the first or the middle of July, take them in and start to fit them.

Mr. Everett: I came in in time to hear most of Mr. McKerrow's paper, and I want to compliment him; it is one of the most exhaustive papers on the subject to which I have ever listened, and it shows how thoroughly he understands the subject and how experienced he is as a shepherd.

It also explains to me some other things that I have never before thoroughly understood. For many years, I was associated with Mr. McKerrow, Senior, in Farm Institute work, and I have often listened to the good points Mac made on the subject of sheep husbandry, but never before thoroughly understood where he got those points. Now I know. I remember being with Mr. McKerrow, Senior, one time at a Farmers' Institute, at Algoma, in this State, at which Mr. McKerrow gave one of his exhaustive addresses on the subject of Sheep Husbandry. After he had finished, an old German farmer rose in the audience and asked permission to ask a question. It was granted readily by Mr. McKerrow; the old fellow says, "Can you tell me what it is that makes black sheep?" Mr. McKerrow, Senior, thought a long time upon the subject and finally confessed that he did not know. The old German says, "Would you like for me to tell you?" "Yess," said Mr. McKerrow. The old German says, "It is the black wool."

Prest. McKerrow: At another Farmers' Institute at Manawa Mr. Everett gave a very exhaustive talk on rearing a calf to produce a good dairy cow, when a gentleman in the audience arose and said, "What kind of a calf would you raise to make a good dairy cow?" which stumped Everett, and he stopped and thought a while, and while he was thinking, a witty Irish-man back in the audience answered, and he said, "Why, a heifer calf, of course."

The Chairman: We have had in this State few politicians who have had the good sense to squander a portion of their energies in farming. I am happy at this time to introduce to you not the politician, but the farmer, W. L. Houser of Mondovi, who will present the subject of the Farmer's Horse.

THE FARMER'S HORSE.

HON. W. L. HOUSER, Mondovi.

Mr. Houser: Mr. Chairman, the Chairman stated at the conclusion of the address of Mr. Tormey that there was a sixty-year proposition involved in his address; that Mr. Tormey stated that "we" had been farming sixty years.

We have been farming about six hundred years this morning. In these very learned papers, in this very intelligent discussion;—the experiences, the successes and the failures of men since almost the foundation of the earth, have been reviewed, and we are able to profit as farmers by these experiences; they constitute a practical experience for all of us of the whole length of time. And what a system of education it is that brings to the mind, to the opportunity of the young farmer the chance to begin where all of the previous experience has left off and to make this a part of his own experience.

Now, my friends, I have learned something this morning, and I have formed a definite, positive resolution, and it is not to attempt to exhaust the subject that is given me, nor to exhaust the audience.

There are many problems surrounding the breeding and developing of horses. And these problems seem to multiply instead of diminish.

The most recent problem, or influence affecting the business, is the automobile. It will not do for the practical man to accept at par the oft repeated assertion of writers in the agricultural press that the automobile does not affect the prices of horses. This is not even horse sense. The automobile does affect the demand for horses. Why, even in modern romance we don't read any more of the blood like horse, the splendid hero and the beautiful heroine, but a Limousine driven by a reckless son of the predatory rich who smokes cigarettes and flirts with other men's wives are the central figures of the light literature of the present day. The automobile is a competitor of the horse everywhere. However, it affects the demand for some classes of horses less than others. The class, or classes that it affects less should be the Farmers' horse. In other words, the farmer should produce that which the market demands. The farm work must be carried on, largely by horse power, and each year some good colts should be raised to turn off at profitable prices. In order to produce the best selling type the farmer should keep for his farm work, mares that will produce the kind that will meet the demand of the market. At the present time this is the draft horse. There is no real demand today at profitable prices for any other type. And then, in my opinion, the average farmer is better equipped to raise drafters than any other type. To produce for the market the coach, carriage, or trotting type of horses involves too much care and fitting. The drafter sells well if he is big, sound, and of suitable conformation. This type is not difficult to produce if ordinary intelligence is brought to the management of the business. And this brings us to a consideration of the ways and means of breeding and developing the high-class draft horses. First, What is a high-class draft horse? Answer: A horse that weighs when mature not less than 1,600 pounds, having a clean cut head, bright prominent eyes, an alert ear not too small, a well arched neck of medium length, well cut up in the throat-latch, moderately sloping shoulders, a short wide back, a rump of proportionate length, neither too straight nor too sloping, strong stifles, well sprung ribs, a good middle, and plenty of heart and lung room. This splendid body must be carried on good legs and feet. The flinty flat bone, short cannons, sloping pasterns, tough round feet, complete the description of a good horse. This kind will go well, look well and sell well. How will we get them? Breed them, of course. Use sires that are right, keep mares that are right, feed properly and you will produce the right kind. "Like produces like." If you breed a sound good mare to a sound good sire the progeny will be sound and good. There may be accidents that will work the exception, but the rule will generally prevail. On the other hand, colts from an unsound sire or dam are reasonably certain to inherit the defects of their progenitors. It becomes very important, therefore, that great care should be exercised in the selection of both sire and dam if we are to produce good ones. It is better to keep a less number and have them right than to raise more cheap ones. I cannot too strongly urge farmers to keep their good brood mares. A sound good brood mare that is a regular producer, cannot be valued too highly. Keep the reliable producers, sell the young, untried ones. But make no mistake in selecting a sire. Under no circumstances breed to an unsound sire. I mean one that shows hereditary unsoundness. Take no excuses for horses with spavins, side bones, curbs, thick wind or any other unsoundness, or that show symptoms of developing them. The sire should be above suspicion of unsoundness. You had better travel fifty miles to find one that is right than to use an inferior one. And, by the way, the good ones are none too plentiful. After the mare has been bred return her regularly to the stallion until she is safely in foal. Don't take her when it is convenient to do so but when she should be returned,—in about eighteen days after the first service, and if she refuses then try her every week for three or four weeks. They are quite capricious sometimes, and great care must be observed or you are liable to lose the use of your mare for a year for breeding purposes, and with a good mare this is a great loss. After the mare is safely in foal she may be moderately worked even if she is raising a colt, but she should be liberally fed, not fattened, but kept in thrifty condition and in smooth flesh. Before foaling time prepare a roomy, light box stall for the mare and her expected baby colt. Thoroughly disinfect and cleanse it, and keep it clean. It is a safe plan to be with the mare at foaling time. Often it happens that a colt is smothered, and occasionally that the mare is lost through difficulty in foaling. A little vigilance at this time may be a very profitable investment. After the colt comes, the first thing to do is to thoroughly disinfect the navel cord. A solution of carbolic acid is a very good application. Make it quite strong. After this it is a question of feed and ordinary care. Feed the mare liberally. You can't feed her too much up to the point of her ability to digest and assimilate. The colt must be fed through its mother up to the time it will begin to nibble oats. Then he will rapidly learn to help take care of himself. He, too, can be safely fed all he will eat of good oats and bran. Wean the colt when he is about four months old. Teach him to drink skim milk and it will put him ahead materially. I have found skim milk a very valuable feed for colts. Keep him going forward. You realize that size is important and there is no time in the colt's life when he will grow so rapidly as during the first year. Keep him going, I repeat. Take care of his feet. Keep them level. This is important. Blemishes, cocked and crooked ankles, and other malformations may be avoided by a little care in this regard. And then it is good discipline for the colt. It helps break him. And, by the way, the time to begin to break a colt is when he is about an hour old. Begin to handle him then and continue to cultivate his acquaintance and confidence, impressing him with your mastery. When you get ready to harness him (at about two years of age is a good time to give him his first lessons in harness,) he will take to it like a duck to water on a rainy day. Now, about all there is to do is to wait until he is of suitable age to attract the buyer. Have him fat when you offer him for sale. He never should be poor at any time from colthood up to the time he goes on to the market. Buy thin, sell fat, that's the idea. You cannot fail by following this method. Breed the right kind, feed properly, and the buyer will do the rest—pay you a price that will be profitable. This is the kind of horse in this day and age that the farmer should produce.

This is the practical, prosaic side of the story of horse raising and, of course, it is an old story. So is the story of salvation. But both are good stories and must be told and retold in order that men may learn the right way. It depends largely upon the way either story is told whether the message will be received and do good. This branch of the husbandman's vocation is so important that too much effort cannot be made to keep in the right way. I look forward to the day when our beloved and highly favored Badger state will be the leading horse breeding state in the Union.

But there is another side to the story.

There is pleasure and inspiration in the business of breeding and handling horses. Some men may be enamored of a machine that stinks and stops, but for me, give me a horse. There is real exhilaration in holding the reins over a powerful, handsome draft pair, feeling the line of communication between mouth and finger tips and from thence to the very soul, or in being seated behind a pair of high bred trotters that are true to the master's will. Their gait is the very poetry of motion. This the pleasure of men fit to be kings. And then the satisfaction of raising good ones is a measure of compensation for the use of a man's intelligence and effort. Who does not admire a beautiful horse? There ought to be some sentiment, some romance, in all we do. There is in the breeding and raising of horses, and all domestic live stock for that matter, something that thrills and exhilarates—that satisfies. We deal with the mystery of life, the susceptibility to training, response to kindness and an honest return to man for his ministrations, and these multiply into a sense of satisfaction that helps to balance and brighten a man's life.

DISCUSSION.

The Chairman: Mr. Houser says he has made no attempt to exhaust this study. It cannot be exhausted and I am sure you have many questions which are in order now.

Prest. McKerrow: Mr. Houser, is there any danger of our horse breeders getting too much of what is sometimes termed "quality" and thus losing the necessary weight, and is that danger encouraged by some of our show rings?

Mr. Houser: There isn't any danger of getting too much quality. There is some danger of getting too much fineness of bone. You ought to know all about the show ring; you do know all about it. The tendency has been as I have observed it in the show ring, to sometimes put your judgment where you wouldn't put your money; that is, a fine, high quality horse of flashy appearance and flashy action sometimes takes precedence over the more substantial, reliable draft horse; I mean in draft rings. And the tendency is a little in that direction, although I could not impress upon you too strongly the advisability or the necessity in a good horse of that almost indefinable thing called quality. You cannot describe it; you have to see it and know how to see it.

Prest. McKerrow: Quality is separate from fineness?

Mr. Houser: Yes, in my judgment.

Prest. McKerrow: And separate from flashiness?

Mr. Houser: Yes.

Prest. McKerrow: In a draft horse, do you want flashy action or strong-going action?

Mr. Houser: I would look for straight, regular, strong action, I wouldn't want them to wing or interfere or go too high, or too near the ground, but a straight, strong movement.

Prest. McKerrow: A movement that would appear to take a load with it?

Mr. Houser: Yes.

Sec'y True: In a breeding animal, would you allow coarseness in either the dam or the sire, and if so which?

Mr. Houser: If I had to take coarseness in either, I would take it in the dam; but I would be sure to get high quality in the sire. I want them to nick well.

Mr. Michels: At what age would you begin to feed the colt?

Mr. Houser: I stayed with a neighbor of yours once while you were gallivanting around the country trying to teach the farmers, Mr. Dixon, former member of this college. He had a pair of colts, and I said, "Why don't you feed these colts some skim milk?" and he said, "I never tried it." I said, "Try it now," and he set a pail of skim milk before those colts. I said to him, "If they ever get their noses in it once, you will have trouble to get them out."

Prest. McKerrow: When we were growing more colts than we do now, twenty years ago, we found some colts that refused to drink skim milk, but we gave those colts a little water, and put a little milk with the water, and when they got used to the color we gradually increased the milk.

Mr. Houser: I never have had to fool them that way.

Mr. Convey: Was that Waukesha water?

Prest. McKerrow: It was Waukesha water, and if my friend here had had Waukesha water in Ireland, he would have been bigger than he is.

Mr. Hill: Was it Shropshire milk?

Mr. Cunningham: Would you say that a stallion that has broken wind is unsound?

Mr. Houser: Well, I would rather not use him. That is an unsoundness as defined by the law in this State.

Mr. Cunningham: Then why do they give a certificate of soundness in such cases?

Mr. Houser: I respectfully refer to the Department of Horse Breeding at the College of Agriculture.

Prest. McKerrow: Will the Department answer?

Mr. Houser: The law is undoubtedly somewhat lax in that matter.

Mr. Cunningham: I knew it was lax and I also knew of that circumstance.

Mr. Houser: I believe the veterinarians define broken-windiness as hereditary, and I think it is to a certain extent. It is so considered by veterinarians, and they are very learned, you know.

Mr. Stone: I would like to ask, is there any locality in Wisconsin more favorable with reference to the selection of either one of the draft types?

Mr. Houser: No, I don't think so.

Mr. Convey: While I consider Mr. Houser's discussion of this subject this morning one of the best I ever listened to, yet we are not here to commend entirely, but to find fault if there is an opportunity. I think he has left out one thing that is a controlling consideration from the farmer's standpoint, and that is the advantage that the farmer has after his foal becomes three years old in using him on the farm, and that he will be a very much better horse for that use. That is the only criticism I would have to make on the subject as presented by Mr. Houser.

Mr. Houser: I think that is true, and if a man can hold himself, and his horse too, it doesn't do any harm to use them a little when they are two years old, but I would not advise that, because they are too apt to overwork them. But they certainly can be worked nicely when the are three years old. Two years ago I sold a three-year old mare. I worked her all summer and then sold her at a good long price, and she had worked steadily all summer long.

A Member: Do you find it profitable to raise a colt from a two-year old?

Mr. Houser: I do not advise breeding fillies at two years old. I picked up a treatise on breeding a short time since by some noted Frenchman, and he said that it will do very well to breed them at two years old and skip the three years and breed again at four. I would rather breed them at three and four.

A Member: What is the matter with a 1,300-pound horse?

Isn't it a fact that a horse of that weight is more in demand than any other size?

Mr. Houser: I admit that a 1,300-pound horse, or a 1,400-pound horse is a very useful horse on the farm, but when you put him on the market he doesn't sell well except possibly to your neighbor farmer. You are breeding for the market, and my contention is, that you must breed something that willl accommodate the market, and in order to do that you must breed 1,600 pounds. You have enough 1,400-pound horses to supply the local demand on the farms.

Mr. Convey: Is not the popularity of the 1,300-pound horse due largely to the fact that you can buy him for a whole lot less money?

Mr. Houser: I presume so. He isn't popular with me.

Mr. Convey: What age do you think is the most profitable to dispose of your stock?

Mr. Houser: Well, pure bred stock can be sold very profitably at two or three years of age, if you are raising geldings for the Chicago market, of course, you must wait until they are mature, but you can make use of them, as has been suggested, during their three-year old form, so it does not cost anything to keep them during that time really, they can be worked profitably, while you are developing them, by using them on the farm.

Dean Russell: Gentlemen, I have a matter that I want to bring before your attention just for a few moments. It is a matter which, it seems to me, is one of the most important things that we can take up in the State of Wisconsin. That is a pretty big statement, but I believe it is a justifiable one.

It relates to the question of the removal of stumps on our central and northern lands. I called together a few of the people last night to talk over some matters in regard to the legislature, and among them I mentioned this one of stump removal. This is a matter that is going to be one of the greatest things that we have got to contend with.

I have gone over the records in the State to find out the amount of available land, and we have nearly ten million acres in Northern Wisconsin of arable land that is uncleared, that is fit for farming purposes.

Now, how much is it going to cost to get the stumps off those tracts of land? As a matter of fact, the people who have done anything along that line say that it has cost them anywhere from five to one hundred dollars, I suppose the average would be $20 or $25 per acre. There are ten million acres of land at $25, $250,000,000 that is going to be spent on this land before it is ready for practical agriculture. Of course, after the forest is removed we can put in grass seed or clover and use it for pasture purposes, but when you talk about land which you are able to plow, the stumps have got to be removed. How is that to be done? Practically, the only methods that have been developed are those that have been developed as the result of experience, and they have ranged all the way from the use of the stump puller of various kinds to the use of dynamite, and certainly the latter method is too expensive.

This is a subject which has given considerable trouble and has received no investigation by any of our Experiment Stations, or by the National Department of Agriculture, and I have put up a proposition to the National Department to know if it were possible to secure the co-operation of the United States Department of Agriculture on an investigation of that sort.

We do not know even how much it costs those farmers where this work has been done, and we ought to know. This matter we have taken up in conference with the State of Minnesota, and they have very energetically taken hold of the matter and today I have received a communication from two of their people saying that they thought that it was of such importance that they propose to ask their legislator for a fund along this line.

They have also suggested a rather ingenious idea and that is the possibility of the State entering into the production of dynamite, causing it to be developed at the State's prison in some way, and Mr. Craig says that while there would be some danger, it is not more so that what we are now doing with our industries in the State's prison.

If this question is investigated to find out the best way for using dynamite or any other system for stump removal, it will certainly be a long step forward.

I have looked over literature to find out if there is anything along that line, and the only thing I can find out on this matter is an article which was presented at a Minnesota Farmers' Institute last year by a man who had practical experience along that line. There is a picture showing the improper and the proper methods for using dynamite.

How many farmers at work in Northern Wisconsin know these things when they start out? They have got to learn them by practical experience, and one of the things it would be well for us to pay attention to would be a problem of this character. Minnesota has taken hold of this matter; they are going to take the matter to the Legislature, and see if it is not possible to make provision for co-operating with Wisconsin and Michigan, and this matter was presented at the meeting of the Minnesota Agricultural Society this week.

I thought it was perfectly proper to bring this matter to your attention, and if it was deemed advisable that the officers of the Association be instructed to present with favor a resolution, to the proper committees of the Legislature, to take up the consideration of this question. This is one of the items which we have included, and is one of the things we want to take hold of this coming year in our agricultural extension work. We want to secure an accumulation of evidence as to the cost of the best methods, and then prepare such illustrated material as will be helpful to be put in the hands of the Commissioner of Immigration, in the hands of all our Northern Wisconsin people, so that they will be given the benefit of this knowledge which they so much need now.

Minnesota is moving in this respect, and I think an expression of opinion from the State Agricultural Society of Wisconsin would be heeded by our Legislature, along this line, as well as appreciated by our sister States with whom we expect to co-operate.

Pres. McKerrow: There is no doubt that this is a very important question. If my memory serves me right, a few years ago, our present chairman, Mr. Scott, talking about the advantages of Northern Wisconsin at one of our round-ups, discussed this question somewhat, and gave some of his experiences in dynamiting stumps and told us how it should be done. So we do not want to acknowledge that Minnesota is the first to bring up this question. Mr. Nordman has brought up this question before.

But as Dr. Russell says, there seems to be nothing definite done, and if it is profitable for the United States to expend money along agricultural lines, here is one of the fields that ought to be looked into, and it strikes me it is perfectly proper for this convention to take action upon it.

It might be your pleasure to wait until afternoon and bring it up in the shape of a resolution. It might be well to have a committee on resolutions this afternoon.

The Chairman: I will ask President McKerrow to appoint such a committee on resolutions.

Prest. McKerrow: Is there any objection to that? If not, to save formality in putting through a motion, I will appoint as such committee, Mr. Scott, C. H. Everett, and R. E. Roberts.

Recess till two o'clock.

The Convention met at 2 o'clock in the afternoon, February 4, 1909.

President McKerrow in the chair.

Prest. McKerrow: Many years ago when I was young like most of this audience, I read in our livestock journals of a farmer and stock breeder down in Kansas who had the push and energy to launch out into the breeding of a comparatively new type or family of shorthorn cattle. That since has become a popular type of a noted breed—Dutch cattle. Later we have all read of the gentleman and the principles that he has advocated in the congress of the United States—in the United States Senate—as a promoter of the reciprocity idea as it relates to farm products—meat prodcuts in the main, produced by the farmers of the United States.

To-day we have on our program the subject of "Conservative Farming." President Roosevelt gave something of an impetus to this idea of conservation in calling together the governors of the various States to discuss this great question. It applies as forcibly to agriculture as it does to timber and mines.

We have with us today this gentleman of whom I speak, and I am now pleased to present to this audience Col. Harris, Ex-Senator Harris of Kansas.

CONSERVATIVE FARMING.

COL. W. A. HARRIS, Lawrence, Kan.

Mr. Chairman and Gentlemen,—I am delighted to see this greatest crop of the country before me. There is no other crop comparable to that of the boys.

I have no prepared address. I have the bad habit of thinking about things a little, and then indulging myself in more or less rambling remarks along the lines that occur to me, and so far as the farmers that are here represented, I feel like apologizing in one sense, because I don't know anybody who are the victims of so much advice as the farmers of the country—unless it is the boys.

Farmers are advised by every kind of professional man; every merchant, every lawyer, every doctor, every divine seems to think that he knows better how to farm than the man who has spent all his life on the farm. It is a curious sort of thing,—I suppose it comes down from our origin—that everybody was supposed to know naturally how to farm, and in this country we seemed to think like Topsy, that farmers just grew and that they knew all about farming by some inspiration that they derived at their birth.

I have had some extensive experience in connection with farming, and I have traveled about some, and I have observed the condition of the farmers in a great many different parts of the country.

To begin with, in my own native State of Virginia, I have tramped all over the eastern part of that State where the colonists first settled, and where they found land and climate that were remarkably adapted to the production of a special crop—that of tobacco, and they grew tobacco all over the tidewater and Southern Virginia, until today we see that Nature has absolutely taken possession and whole counties in the eastern part of the State are going back to the condition of the primeval wilderness and growing up in pine and scrub oak, simply waiting for years and years of Nature's slow process to build up the soil again.

Down in the Southern States,—I have been through Alabama and Mississippi and Georgia and the Carolinas, and there they had cotton and they grew cotton, world without end, generation after generation, until today the worn and scarred hillsides seem to cry out to the heavens against that sort of waste.

In the New England States are thousands of abandoned farms, absolutely forsaken by their owners. The vines and shrubs and the trees are growing up through the buildings themselves, thus showing that Nature has been violated and wronged.

Out in the West, in this State and in Minnesota, they have had a similar experience with wheat. It has been wheat, wheat, wheat, until Nature is tired and the earth refuses any longer to respond to the efforts of the farmers.

In my own adopted State, Kansas, where I have been for more than forty years, we found there a virgin soil, and we grew corn, corn, corn, all the time, and even Illinois, the great cornfield of America, has gone through the same experience and the average annual crop shows that a change is absolutely essential.

The chairman alluded to what Mr. Roosevelt did last summer. It was a magnificent idea; he called together a lot of distinguished men—I myself had the honor of being invited down there but unfortunately I couldn't go, which I regretted afterwards very much indeed.

While they talked about the conservation of our forests—an immensely important question,—one every man should think of, and no man should anywhere cut down a tree without careful thought—they talked about the conservation of our mineral resources, our iron and our gold and other important topics, but unfortunately there was nobody who seemed to be impressed with the necessity of a national crusade, a revival of interest all over the country, in the preservation and conservation of the greatest asset that Nature has endowed us with in this virgin country of ours—that is the fertility of the soil.

There is nothing comparable—it is a trite axiom to say that agriculture is really the basis of all prosperity—that is admitted, except when some of our railroad friends assert that the prosperity of the country is due to the railroads; but fundamentally we know that agriculture is the basis of all prosperity in this country and must eternally remain so.

The live stock industry, as a matter of course, is the sheet anchor of agriculture. Agriculture itself would languish and fail were it not for live stock culture, and I am delighted with the work that is being carried on, that I see in this State through your Farmers' Institutes, your magnificent Agricultural College and everything of that kind, and it is common to all, particularly of our Western States. I have been in Iowa, I have been in Kansas, Nebraska and Missouri, in all the great agricultural colleges, and it is the most magnificent guaranty of the future of this country that I have any knowledge of. They are becoming magnificent arsenals of information; they are arming and equipping a magnificent army of boys who are going out to do this great work, not as we did when we were boys fifty-odd years ago. They are standing upon our shoulders, their horizon is enlarged, they are equipped with all the modern weapons, offensive and defensive, which pertain to the great work that they are about to undertake.

I only want to talk to you a little bit about the fundamental ideas, and I called my topic "Conservative Farming," because when your Secretary honored me with an invitation to come here and I accepted, I didn't really know just what I might talk about, but it seems to me that conservation, in the sense of preventing waste, is one of the most important topics that can be discussed or thought of by anybody at all in this country who is alive to the opportunity.

I have just returned from a long trip. I went out to Denver and from there to Los Angeles, around by the Southern route and through the southern part of Arizona and the great deserts of New Mexico and Southern California, coming back by the way of Utah, through Wyoming and down through Nebraska.

There is a wonderful field offered to man on those deserts. There will yet be a way found by which they will ultimately be made to respond to the necessities of man.

In this great interior country which has been so richly endowed by Nature where everything has seemed comparatively easy, it is a shame that we could not have taken up the subject of conservative farming years and years ago.

Now, I understand clearly the difficulties under which a great many farmers live; I know something of the hardships of the beginner on the farm. Forty years ago I saw a man who came out and settled in a dugout on a Kansas quarter section, or in a little box house built out of green cotton wood lumber, and the winds would sweep through his little home, with the thermometer down below zero and his poor wife, poorly clad, insufficiently fed, with her little children clinging around her knees, and I have realized the attitude of triumph, because the winning of the West has been attained. Now, it is idle to say to those men and women, "You should do so-and-so." But times have changed. They are all past the pioneer period; they are reaching out, and as I said at the beginning, their boys are preparing themselves for a more intelligent and fortunate and more happy beginning of their experience.

Now, what is the fundamental thing in the conservation of the fertility of the soil? I have traveled through England and Scotland from the southern to the northern part, and everywhere I went I was astonished and delighted. I found that the thing above all others that the Englishman regarded with respect, regarded almost with veneration, was grass. I found fields that had been in grass for three hundred years. I found that in every English lease there was written a clause that the sod should not be broken, except upon the very severest penalty, as much as $45 to $50 an acre, and that it should be replaced in a very careful way.

Grass has been the fundamental thing. Grass has been the great conservator of the fertility of the soil of Great Britain and lands, which, for centuries, have furnished a supply to the inhabitants of that great little island, have been maintained, and are more fertile today than they were centuries ago.

Grass and stock go hand in hand most always, being absolutely the sheet anchor of farming. There is no farm in Wisconsin or anywhere else in my judgment which, if properly handled, which, if kept at least one-half all the time in grass and gradually changed in the proper rotation, will not produce more now, yes, double the grain crops which it now does and yet constantly be growing better and better.

The chairman has alluded to myself somewhat personally, and yet the proudest thing that I have in my memory is that I took a farm forty years ago and that when I left it a few years ago there was not a single acre, on the arable portion of the farm, that would not produce one hundred bushels of corn to the acre in any average season. I had kept it in grass; when I wanted corn I would turn over the sod, and I got in return yields that astonished my neighbors whose land originally was just as good as mine.

It is the practical part of it that I am sure of when I talk to you about that kind of farming. I won't deny that I have been the kind of farmer who likes to do a large part of his farming on horseback, which is an easy way of doing things. And I like cattle, I like sheep, and they are all necessary.

The Chairman alluded to some work with regard to reciprocal trade relations with the rest of the world. I have been impressed for many years with the fact that we ought to encourage the export of our meat products and our flour in preference to grain. I worked hard to endeavor to do away with the differentiation that existed in favor of the export of wheat, and to give the preference, if anything, to the export of flour. I have been doing everything that I could to relax their sanitary restrictions as to our meat production, because there are three hundred million people in Europe only too anxious to have a share in what to us is largely wasted. Every ton of meat products that reached their shores leaves our country better than it was before. Every ton of steel that goes abroad is a permanent diminution of our resources in that direction; every article made of wood is a diminution of our resources, but when we come to export our meat products and feed the nations of Europe to their advantage as well as ours, we are doing that which makes us richer and better and our land stronger, more capable of responding to increased demands.

Some gentlemen say that it is useless to think about our foreign trade, because the population is increasing so rapidly in this country that we cannot expect very long to have any surplus.

That seems to me to be the utterance of a man who is absolutely ignorant of the productive capacities and possibilities of this country. We have got a wilderness yet to reclaim and we have got to increase and double the production and the fertility of our older States. There is no trouble but what year by year we can increase and normally expand our foreign trade in these products that leave us better off and maintain the fertility of the soil.

There is another question too that people ought not to lose sight of. It is not all a question of dollars and cents. I appreciate the importance of the commercial aspect of these questions; necessity forces us to an acute consideration every day, of that side of the question; there is, underlying all these things a higher question. If you were to rob the whole country of all sentiment, if you should say that there should be no considerations of sentiment, this world would not be fit to live in, and there is a sentiment underlying this question, and that is, that our possession of the little territory that we occupy, the acres that we call our own here today, is really only in the nature of a temporary tenancy—a temporary trusteeship, and that it is just as much a patriotic duty of every man who owns a piece of land, as any other can be, to hand it on down to his sons or his grandsons, or to whomever may come after him in this country absolutely unimpaired.

We worship military heroes; we look upon a man with reverence who has shown the kind of courage that braves death and danger; we worship him, and in every direction we see great monuments and colossal equestrian statutes, everything of that kind, but there is just as much patriotism, just as much worthy of being proud of in those who study these every day questions in times of peace. It is just as patriotic to do your duty as a citizen of this country in times of peace as it is to do your duty as a soldier of this country in times of war. Do not forget that. It is not so glittering, but it requires just as much courage, a greater degree of persistency and a higher conception of duty.

It is an easy thing when the roar of the hostile gun sounds near us, or the beat of the hostile drum cleaves the air in our faces; it is an easy thing for young men like you to be inspired with the idea of rallying around the colors and taking your place on the firing line. There is a thrill, an excitement about it, that is fascinating to every American, but I want you, young gentlemen, I want you most earnestly to remember that it is just as great an example of patriotism to do your duty here and to conserve the resources of this country, to go steadily along those lines, as it is in the other things.

Of course the sowing of grasses is a trite subject, and yet how few farmers realize the importance of experimenting, ascertaining the kinds of grasses, which are suitable to their particular localities, and even when they have gotten it, they seem to think it all done with; and when the grass grows they are willing to have a sheep or a cow waiting for every blade as it

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comes up. Grass must be taken care of. Grass must be encouraged.

Some time ago I was talking to our great Secretary of Agriculture. I know him well and his predecessor, Mr. Sterling Morton. That was the very beginning of the Department of Agriculture. Mr. Norman J. Coleman was the first commissioner of agriculture, and for a short time had the title of the Secretary of Agriculture, but it really began to be adopted at that time. We had never had any particular administrator of the affairs of this country agriculturally; never seemed to have been important enough to have an absolute department and its secretary or its head did not sit at the cabinet table until that time.

He was asking me what I thought was the field of work of that Department of Agriculture. Of course, that was a difficult question to answer, and yet coming from the West, as I did, and seeing how the native grasses were being absolutely destroyed—the buffalo grass, that grand product of the Western part of the State and the prairie grass in the eastern part of the State—all being driven out, and we didn't know what grasses we could use to take their places—I said, "Mr. Secretary, you should have your agents all over the world, in Asia Minor, in Hindoostan, everywhere, sansacking all the hidden places and finding grasses which will be adapted and which can be sown and continued to be sown, out in our Western country. The native grasses are being destroyed and their places should be taken with something better, something which can be gathered and utilized in every possible way," and I am glad to say that that to a certain extent was undertaken.

The work of this Department became greater and greater, and under Mr. Secretary Wilson, we have had a large number of new varieties of grass—new varieties of alfalfa, new varieties of clover, and everything which goes to sustain animal life to preserve the fertility of the soil.

Those are the questions that have appealed to one with most tremendous force. If you go out into the West, you see that work going on there. I talked to the Colorado stock growers the other day, and I said to them, "Above all things join in with this movement for protection of public lands in order that you may preserve your native grasses." Under the old system of allowing herds and flocks to wander at will and the ranges to be overstocked, the grasses were literally disappearing, and I hope that policy will be carried out.

There are no grasses in the world superior to those, so far as nutritive qualities are concerned—they are the native product of the environment, the climate and the soil. They are sparse and thin, and we should endeavor to supplement them with better grasses in every possible way.

I don't know really whether Wisconsin is a state which is devoted to pasturage very largely or not—I have gotten the impression that you were formerly devoted to the growing of wheat, and that in later times you have taken up largely the dairy side of farming. I think that is absolutely necessary. That necessarily comes with increased population, but I doubt exceedingly whether you fully realize the importance of nursing and encouraging your grasses.

Farmers complain of their farms. Farmers complain of their pastures a great deal; I have heard it. I have heard an old saying down in my old state that blue grass would not grow for anybody but a rich man, simply because the poor man had to overstock his pastures, always; never gave it an oppportunity to cover itself and cease to be exposed to the summer sun.

But intelligent management is necessary. This everlasting complaining reminds me of a story that my friend, John Allen of Mississippi, used to tell in the House of Representatives. He said he was sitting in his office one day and a gray-headed old darky came in and he says, "Massa John, I got to have a divorce. Mandy is driving me crazy with her extravagance. She wants a dollar on Monday and a half a dollar on Tuesday and a quarter on Wednesday, and then a dollar again on Thursday and half a dollar on Friday—something every day, and I just can't stand it. Massa John, I'm doing distracted." "Well" Mr. Allen said, "what does she do with all this money? How does she spend it?" "I don't know, Massa John, I ain't given her none yet."

That is about the situation here. You tell a farmer that he ought to take all of his manure—the fertilizer from his barn and stables—and take it out and scatter it while it is perfectly fresh, before it has lost, practically, its value by washing and by leaching,—scatter it on his pastures,—it seems heretical to a great many. I hope up here it doesn't seem so strange, but that is one of the ways of Nature, to take a lot of material produced from the subtle alchemy of the animal—and I believe about 80 per cent of all the animal consumes is returned to the land, only 20 per cent is actually utilized in the production of meat, sustaining the health and growth of the animal, so that it goes back on the land and should be taken care of, and the way to do it, with the corn crop, commence to feed the grass crop. The way to fertilize your fields is to fertilize and get the fertility into the soil before it is turned over to be followed by wheat or any other crop.

It is said that a great many years ago in England, a gentleman who was recently married, was tremendously interested in the future education of his son whom he was expecting. He went to a learned professor and asked the professor, "What shall I do first for the education of my son, when shall his education begin?" "Why, my dear man, his education should have begun with his grandfather." And it is about the same way with some of these things. It is not the immediate time, but you have got to provide in advance for the manipulation of the soil.

And so I want to urge on you the conservation of the fertility of the soil by the growing of the best possible grasses, by the fertilization of the best possible grasses and by the utilization of the greatest amount of stock that is possible.

In traveling over England, particularly the northern part of England, which perhaps appeals to my friend, the chairman, somewhat, I found pastures in Yorkshire that I was told had been in grass ever since the battle of the Standard was fought between the Scotch and the English, and I found in every direction on these pastures cattle and sheep of every imaginable breed. All were excellent, some perhaps, better than others, but the one you like best is always the best for you; remember that. It is a good deal like marrying a wife—the choosing of a breed of cattle, or the choosing of a flock of sheep—the one you like best, or the wife you like best, is going to do the best for you because for that one you will do your best.

Nothing is drudgery to me when it comes to taking care of good Shorthorn cattle; there is no imaginable thing connected with them that I do not and have not done over and over again, cheerfully and gladly. I believe it has made me a better man; and that is true of other breeds to other people. If they are the ones you like best, it is like your wife—the girl you like best will make you the best wife, and all good cattle, all good sheep improve the man who handles them. A man cannot take care of any good animal without being made a manlier man, a more gentle man, a better husband and a better father.

So you young gentlemen can begin to educate yourselves along those lines now, prepare yourselves for what is before you.

Now, I never can talk about grass without thinking about a wonderful article that was written on grass a great many years ago by my predecessor in the Senate of the United States, Senator Ingalls. He wrote an article on grass, a large part of which I think should be emblazoned upon the walls of every Agricultural College in the United States. It was full of poetry, indeed it has been called a prose poem, but it was also full of the most profound truth. It began thus:

"Next in importance to the divine profusion of water, light and air, those three physical facts which render existence possible, may be reckoned the universal abundance of grass.

These words, as I say, are full of sentiment, but they also contain that most important econmical truth underlying the conservation of the fertility of the soil, and I hope that in this magnificent institution so superbly situated here, that your thoughts are being directed to the importance of the conservation of the fertility of the soil, and to the necessary means to that end, the proper growth and the proper nutrition, the proper care of your grasses, to the end that we may increase these exports which leave us richer, which leave a better heritage for those who are to come after us. I thank you very much for your attention.

The Chairman: It is a Wisconsin custom, Col. Harris, to quiz a man every time we have an opportunity.

Col. Harris: I shall be happy to answer any questions.

The Chairman: The Colonel has covered a broad field here. I know he has developed many thoughts, and you possibly have some questions you would like to ask the Colonel.

A Member: I would like to ask the Colonel how those people in England fertilized those grass fields that he states have been in grass for two hundred years or more.

Col. Harris: I believe I said, Mr. Chairman, that everywhere in England you saw cattle and sheep and live stock, everywhere. Grass to the farmer means cattle, means sheep, means production of meat. Then you must remember too that Great Britain has been wise in her day and generation and that she is the greatest buyer of any foreign country of our Minnesota meal or bran. She sees the wisdom of buying the by-products of the wheat, and that is why we should encourage the export of flour and keep the by-products of the wheat here. It is along just those lines that she has shown her wisdom.

Mr. Convey: I would like to ask Col. Harris of how much importance is the growing of alfalfa in Kansas, and if they had any difficulty in establishing its growth in the first place?

Col. Harris: If there is any one particular thing that will arouse and excite the enthusiasm of a Kansas man, it is alfalfa. Alfalfa is everything in Kansas, it is king in Kansas. My first knowledge of alfalfa goes way back to the time when I was a boy with my father in the Argentine Republic. Alfalfa was first introduced from Spain and Algeria to Buenos Ayres, and then went across and up to the coast of California, and came by the back door east. I purchased my first alfalfa seed, twenty bushels of it, way back in the early 80s. I didn't know how to use it; I sowed it as I thought it should be sowed, but of course the weeds came up and it was soon useless.

Mr. Convey: Did you have difficulty in establishing the growth of alfalfa in you State?

Col. Harris: None in the world. The Department has had a good deal to say about inoculation of the soil, but I have never yet seen a piece of land that, if given a light top dressing of barnyard manure, will not grow alfalfa without any inoculation whatever. There may be something in the Eastern States in that proposition, where it is well to facilitate the matter by getting this peculiar bacteria into the soil, but we have no trouble on any well drained soil. It must be underdrained, it cannot have an impervious subsoil; but take our land, along the slopes or upon the uplands, if it is only top-dressed a little, we have no trouble, and regard it as the most desirable forage plant known to man. I have been an enthusiast. I succeeded in getting the Maryland Agricultural College to try it, and it does well there. I got the manager of the Soldiers' Home in the District of Columbia with poor, gravelly hillside land to top dress and sow alfalfa, and it did well there. As a matter of course, there is a frost line beyond which it cannot go. I imagine from some conversation I have had with experts in the Agricultural Department, that what is called Turkish alfalfa, which was one of the plants brought in through the Agricultural Department, that it would do well here without any trouble at all. It grows on the high steppes of Turkestan, and has been grown over here. It gives us more to the acre than anything else I know of. We frequently have our cattle grazing on it all the early part of the summer, and still get two good crops of alfalfa off the land. I think every Wisconsin farmer ought to try some experiments in that direction. I do not know of any animal that does not prefer alfalfa to any other forage crop, from chickens up to horses, they will leave everything else, if they can get it. Of course it used to be considered a joke that you can fatten hogs on hay, but you can on alfalfa.

A Member: Do you sow it out there with a nurse crop or without it?

Col. Harris: Without it in all cases. That is one of my fads about grasses of all kinds, particularly alfalfa; we sow it alone and the best success with us in always from sowing in the fall. Get your ground ready by September and sow it at least that early, and then it comes up early, has a good start, and you will get three or four crops the next year.

I don't like nurse crops, I never sow grass of any kind with a nurse crop, because I know it robs the grass. Of course we do get a crop of clover sowing in wheat, but my plan has been to prepare the land and sow the grass and the grass would take care of itself better than when it is planted and shaded and robbed and weakened by the nurse crop. And then you go in and cut off the nurse crop and expose it to the torrid sun of July or August.

The Chairman: We would like to continue this discussion, but we have more to follow, and we will have to wind it up. It has been a grand, good discussion from start to finish.

The next topic we have on our program is that of the influence of the sire, to be presented to you by Prof. Eckles, of Columbia, Mo.

TRANSMISSION OF DAIRY QUALITIES BY THE SIRE.

C. H. ECKLES, Professor Dairy Husbandry, University of Missouri.

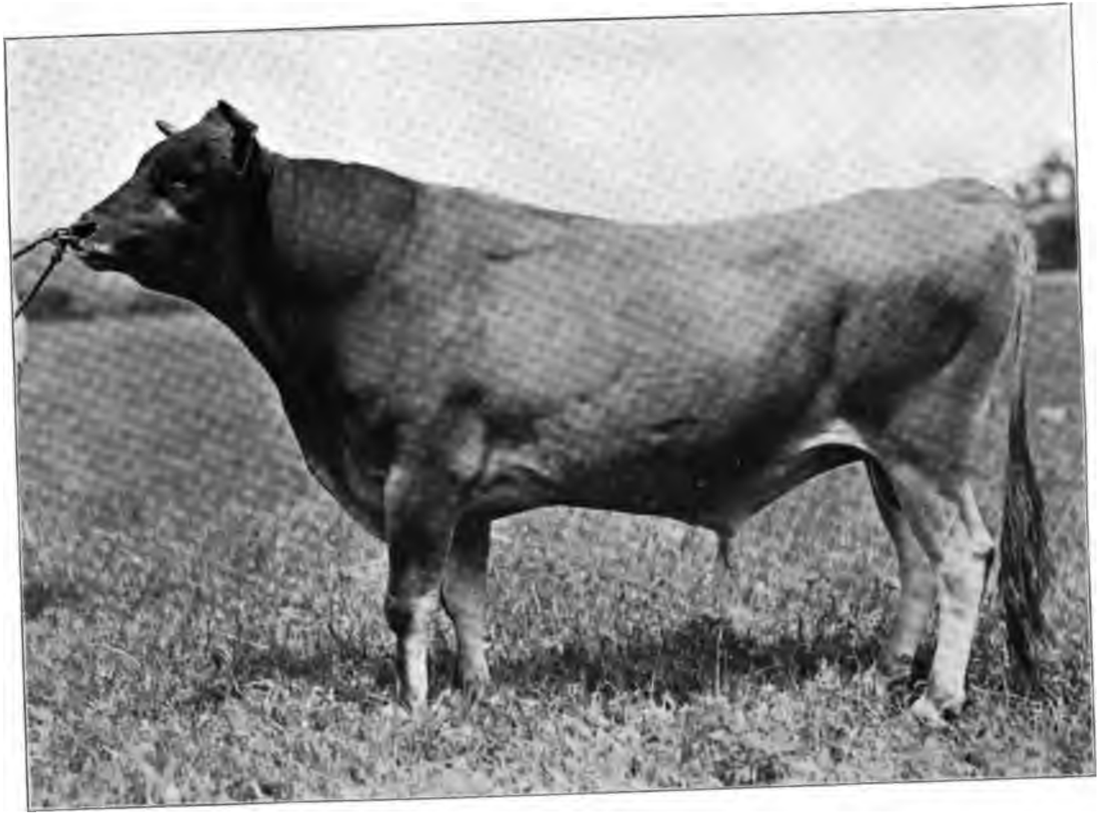
It has long been an axiom of the breeder that the sire is half the herd, and it is generally accepted as a fit expression of an important rule.

The skillful breeder of any kind of stock does not need to have it pointed out to him how important it is that the sire be properly selected. If he is a skillful breeder, it is largely because he realizes the importance of the sire and knows how to select him. While the skilled breeder realizes the importance of this in breeding, the average dairyman does not give the question of the selection of the sire one-tenth the attention the importance of the question demands.

Thousands of men make use of a scrub or grade sire on account of mistaken economy in cost rather than pay a few dollars more for an animal that is almost certain to transmit desirable qualities. It is not surprising that we have so many worthless cows. They come by their worthlessness in the majority of the cases from sires worse than worthless. Some of these scrub bulls are registered in the herd books.

The most forcible means I have at hand to illustrate the remarkable difference in sires is to show some results from our own herd. In 1884 the Missouri Agricultural College bought four registered Jersey cows and the entire herd we have on hand today is descended from these cows. Of course, herd bulls have been purchased from outside but no female has been bought. Since 1892 complete milk and butterfat records have been kept of every cow. Up until 1901 practically every female was retained in the herd regardless of her dairy qualities. These conditions give an opportunity to study the effect of sires which can hardly be duplicated anywhere.

The first bull used was Missouri Rioter 19400, a son of Bachelor of St. Lambert. There is no record indicating the dairy quality of his dam. In fact his sire is the only animal in his pedigree known to be a strong breeder. This bull was a very

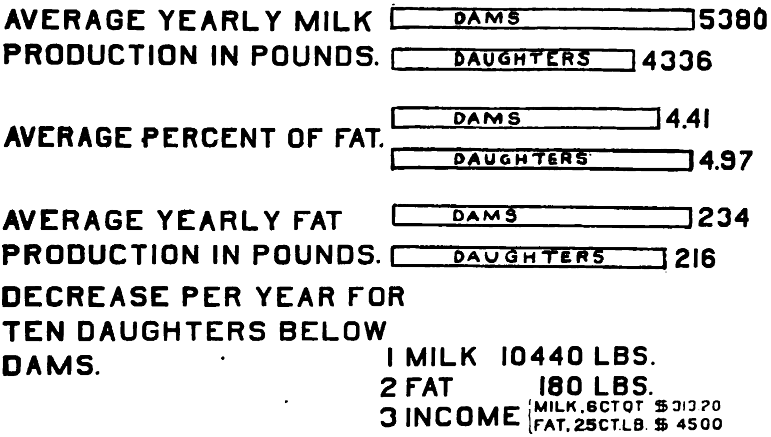


Jersey Bull.

weak breeder as is shown in the chart. His daughters averaged 4,336 pounds of milk per year while their dams averaged 5,380 pounds. A decline on the average of 1,044 pounds of milk per year each. The average yearly fat production of the dam was 234 pounds, while the daughters averaged only 216 pounds. A decline of 18 pounds per cow annually from the dams to the daughters.

The income from ten daughters, counting milk at six cents per quart, fell $313.20 per year behind the dams. Counting fat at 25 cents the loss was $45.00. As long as this bull remained in the herd it was going backward in production instead of ahead. Suppose the herd had had thirty daughters of such a bull. Each year we would have been $135.00 behind what the dams produced, counting fat at 25 cents. If these cows were milked six years each, the total loss would be $820.00. This sum would buy several good bulls.

RECORDS OF
TEN DAUGHTERS OF MISSOURI RIOTER
AND THEIR DAMS

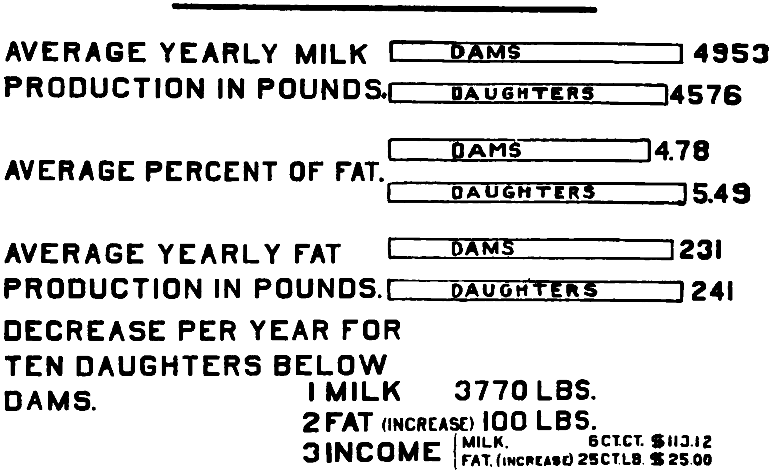


The next bull used in this herd was Hugorotus 34447. This was a cheap bull without many tested animals in his pedigree. His mother, however, is said to have been a good cow. The daughters of this bull were inferior to their dams in milk production but on account of a higher per cent of fat they gained slightly in fat production.

It will be seen in the chart that the ten daughters fell a total of 3,770 pounds of milk per year behind their dams but gained 100 pounds of fat. The general results of using this bull were disastrous. In fact, the poorest animals ever in the herd were his offspring. The averages shown are made as good as they are only by the fact that two full sisters sired by this bull through some "nick," proved first class animals.

When this herd was culled on milk records alone, nine out of the eleven daughters of this bull then in the herd were sold to the butcher. The two remaining were the full sisters mentioned. As long as this bull was in the herd, the general tendency was backward.

RECORDS OF TEN DAUGHTERS OF HUGOROTOS AND THEIR DAMS

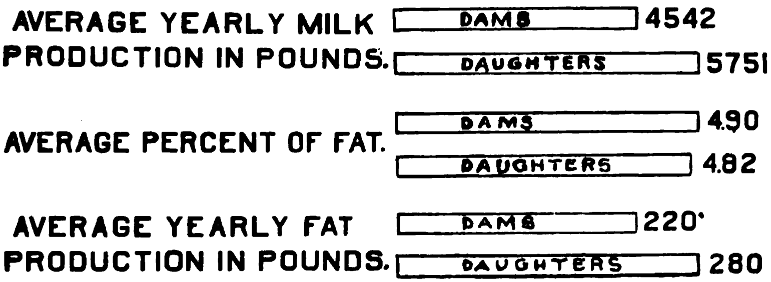


The next bull at the head of the herd was Lorne of Meridale 34024. This bull had a splendid pedigree from the standpoint of records and his offspring show the results. His daughters, with one exception, were all superior to the dams.

The chart shows that the average milk production was raised from 4,542 pounds per year to 5,751 pounds; the fat production from 220 to 280 pounds per year. At butterfat prices the ten daughters of Lorne of Meridale returned each year $150.00 more than their dams. What a difference from the results from Missouri Rioter, If we had milked thirty daughters of this bull six years each, their product would have exceeded their dams in value $2,700.00; while the daughters of Missouri Rioter went $939.00 behind, or a difference in thirty cows in six years of $4,639.00 in actual income.

What would be the value of Lorne of Meridale in a large herd? We cannot say, but I am convinced that as a business proposition an owner of a large herd could better pay $1,000.00 for him than accept Missouri Rioter as a gift. Yet if he had been offered for sale when mature, the chances are that instead of bringing what he was worth, he would have brought little more than a bull beef price.

RECORDS OF TEN DAUGHTERS OF LORNE OF MERIDALE AND THEIR DAMS



INCREASE PER YEAR FOR TEN DAUGHTERS OVER DAMS.

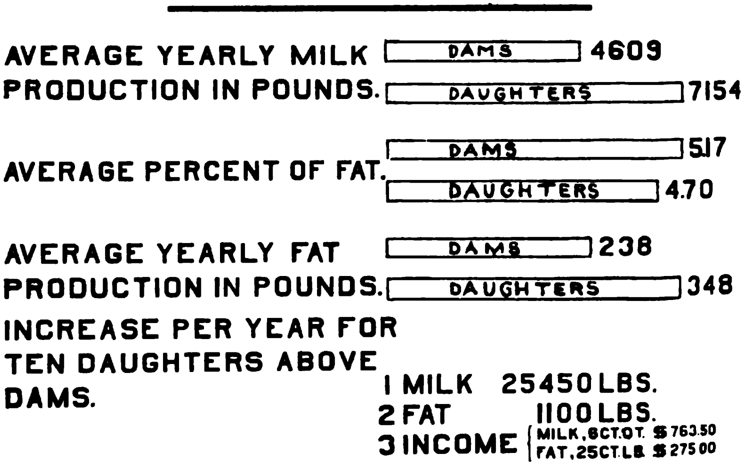
1 MILK 12090 LBS
2 FAT 600 LBS
3 INCOME {MILK, 6 CT. QT. $362.70
{FAT, 25 CT. LB $150.00

The next herd bull was Missouri Rioter 3rd 34587. This bull was the son of Missouri Rioter and was the only good thing this latter sire left in the herd. The remarkable qualities of Missouri Rioter 2nd may come in part from his dam which was the best cow in the herd up to that time and like the sire the daughter of Bachelor of St. Lambert.

The best cows ever in our herd were sired by Missouri Rioter 3rd. From dams with average records of 4,609 pounds of milk he sired daughters whose records average 7,154 pounds. The dams averaged 238 pounds of fat per year and the daughters raised this to 348 pounds.

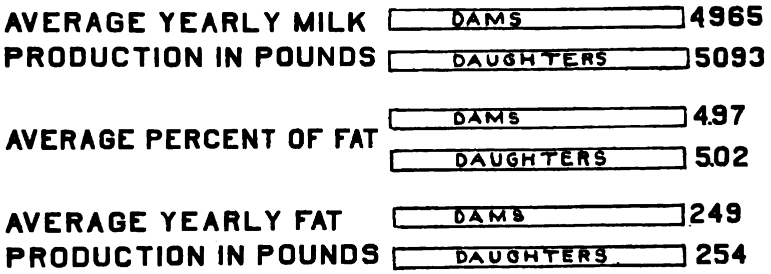
The daughters of this bull produced $275.00 worth of fat per year more than their dams. Counting this on the same basis as before, thirty cows for six years, we have $4,950.00 worth of butterfat produced by the daughters in excess of that produced by the dams. What would be the value of this bull had he been owned by an association of neighboring dairymen where he might have had one hundred daughters or more? This bull was raised on the College farm and, as is often the case, because he was a home product, instead of coming from a distant State, he was not counted of any special value and was sold from the herd without any record even being made as to his purchaser, and he was never transferred. His remarkable breeding value was recognized when it was too late, and now we would like the chance of giving $1,000.00 to have him back.

RECORDS OF
TEN DAUGHTERS OF MISSOURI RIOTER 3RD
AND THEIR DAMS.



Minette's Pedro 50031 is the last herd bull with a sufficient number of daughters to give figures of any value. It may be observed that the herd remained practically at a standstill while he was at its head. In general this bull was not a very prepotent bull since we have wide variations and a lack of uniformity in his offspring. Among them are some excellent cows and some worthless. From the good dams we secured good daughters; from inferior dams the same quality of daughters.

RECORDS OF TEN DAUGHTERS OF MINETTE'S PEDRO AND THEIR DAMS



INCREASE PER YEAR FOR TEN DAUGHTERS OF MINETTE'S PEDRO OVER DAMS.

1 MILK 1280 LBS.
2 FAT 50 LBS.
3 INCOME | MILK. 6 CT. QT. $38.40
| FAT. 25 CT. LB. $12.50

These figures show the immense difference in the way dairy qualities are transmitted even where all are pure bred animals. The selection of a herd bull is a very serious matter for the man who is trying to build up his herd and the higher developed they are in the way of dairy production, the more serious is the problem.

In the beginning the old axiom was repeated that the sire is half the herd. By using the figures given it can be easily proved that this statement is not only true but in some cases at least should be made still stronger. Suppose we take the records of the daughters of Lorne of Meridale. This animal sired twelve cows in the herd that gave an income of $17.48 per year over their dams, counting butterfat at 25 cents per pound.

If this bull had been at the head of a grade herd of 20 cows for five years, we would have had something like the following result:

We could count on possibly 90 calves being dropped in that time of which 45 would be heifers. Of these, 40 should be matured and come into milk. At the average increase in income of the twelve daughters of Lorne in the Missouri Agricultural College herd, namely, $17.48 per year, these 40 heifers would produce $699.20 income per year above their dams.

If they were in milk six years each, the total income would be $4,195.20 above that of their dams; an increase which can be reasonably credited to the influence of the sire. The original 20 grade cows would be valued possibly at $1,500. This sire would be worth in a herd of this size over $800 per year, or half the value of the herd every year.

A similar calculation could be made showing the enormous loss that would have resulted from using Missouri Rioter in a herd of equal size.

It should be noted that this is assuming the improvement in the production of grade cows by using such a sire would be no greater than was the actual case where the dams were already pure bred. We all know if the dams had been grades of inferior breeding, the results would have been still more marked.

A Missouri farmer gives me the following interesting figures showing the effect in milk production of a dairy sire as compared with one not of dairy breeding. He owned a western bred grade cow. Her first heifer was sired by a grade beef bred sire, her second by a pure bred Jersey. The mother averaged 3,085 pounds of milk and 117 pounds of fat per year. The daughter by the grade beef bred sire averaged 3,700 pounds of milk and 133 pounds of fat. The daughter by the Jersey averaged 6,000 pounds of milk and 240 pounds of fat. Counting fat at 25 cents per pound, the income of the dam was $34.19 per year, that of the daughter by the grade beef bred sire $38.85, and that by the dairy bred $70.00.

In a herd of 30 cows, if such results be secured on the average the income per year for the daughters, if by the dairy sire, would be $960 per year more than the income from a like number by the grade beef sire.

What would be the difference in value of these two bulls for the dairy farmer with 20 or 30 cows?

One of the chief difficulties in selecting the sire is that practically nothing can be predicted from the looks of the animal, if he has the inherent characteristics of transmitting good dairy qualities or not. Who will undertake to judge by the appearance of a bull if he is one that will transmit dairy qualities as did Missouri Rioter 3rd or whether he is as worthless as Hugorotus?

The man who will discover some means of so judging will confer a benefit on breeders that can scarcely be estimated.

There are two principles that are especially concerned with breeding, and should be kept in mind. The first is that "like produces like," and the second is the law of "natural variations."

The cow in the condition that nature made her undoubtedly produced only milk enough to feed the calf for a few months until it could subsist on other feeds. This milking characteristic was transmitted quite regularly. It was a case where like generally produced like but some cows even then were undoubtedly better milkers, due to the law of natural variation. The principle of selection did not come in to retain this variation, and no improvement in this characteristic was made.

After cattle was domesticated the same conditions existed but finally man began taking advantage of the natural variations and began saving breeding stock from those having the characteristics such as greater milk production which he found to be valuable.

The animal which is different from the others of its kind by natural variation will reproduce this characteristic in a certain proportion of its descendants. If this same natural variation is in the ancestry of both parent, the chance of transmission is much greater but under any circumstances only a part of the progeny will have the new characteristic.

The dairy cow of today is largely an artificial product, or perhaps it would be better to say she is an abnormality, since her mammary glands have been abnormally developed by taking advantage of the law of natural variation. The rule of "like produces like," is only true to a limited extent and the farther we get away from the original type in breeding the smaller the proportion of cases where it holds good. This accounts for the fact often observed that the offspring of a phenomenal cow are often disappointing. However, it will be found that on the average there will be more good animals among the offspring of such a cow than among those from a cow of moderate, or low dairy capacity. We must always expect to find inferior animals appearing frequently in all herds. No breeder can prevent it, but no good breeder fails to reject the inferior ones promptly when discovered. The higher developed we get our cows, the more difficulty we must expect in keeping them all up to standard.

In selecting a bull for a mixed herd or one of a low dairy capacity any well bred bull of a dairy breed with good producing individuals behind him is certain to benefit the herd. Even for the grade herd, the exceptional bull that will transmit qualities higher than the average of his breed is worth more than two or three inferior ones.

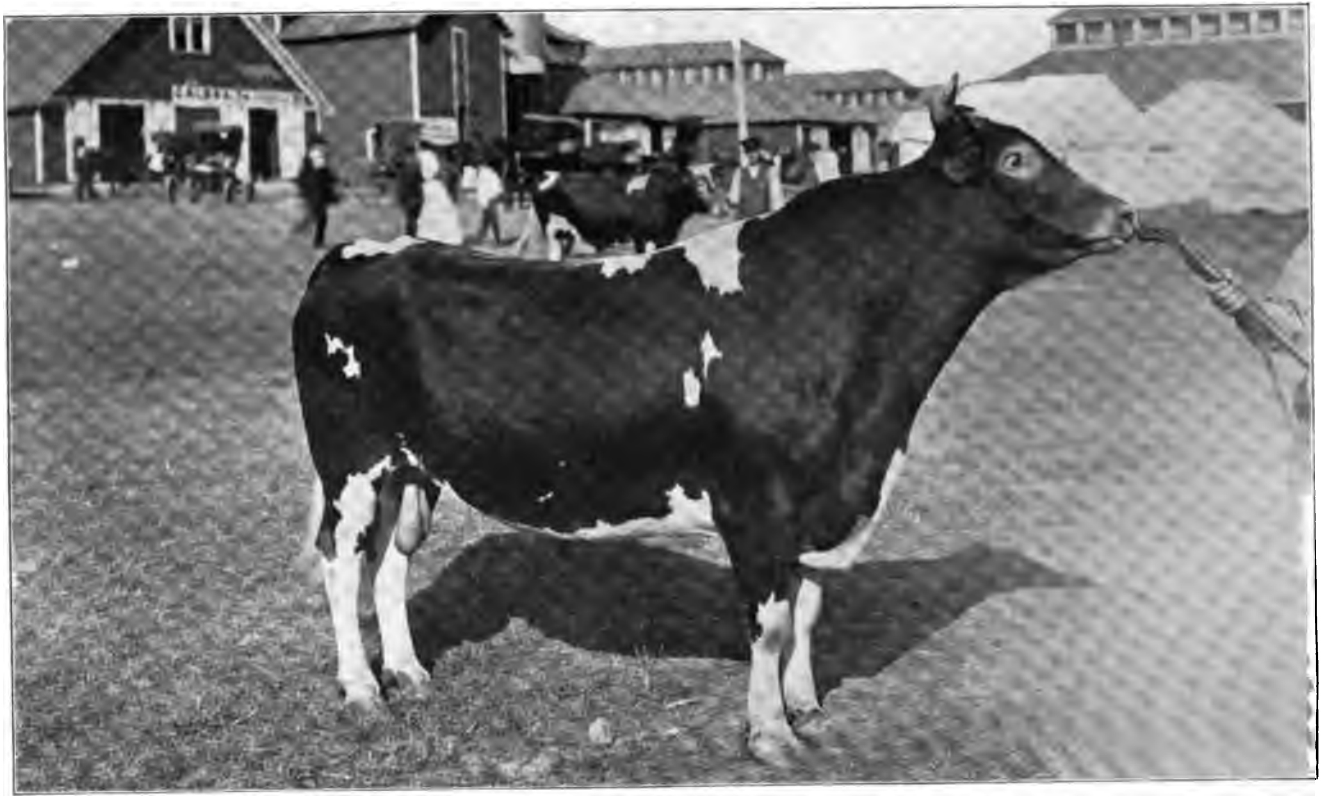
There are two courses open to the man selecting a herd bull: One is to buy a young bull on the strength of the records of his ancestors and trust to luck to a certain extent that he will be one that will transmit the desirable characteristics of his ancesters to a high degree. As a rule, such a bull will do fairly well at least in transmitting these characteristics. For the owner of grade cattle or herds of low dairy capacity, this method of selection does very well.

In selecting a young bull the pedigree including the record of ancestors is of as much or more importance than the individuality of the animal. The things to be looked for in the pedigree are, first of all, records of production by the dam of the animal, if you are breeding for milk production. If you are breeding for show animals, get a descendant of show animals.

There are some who refuse to have a bull from the phenomenal record making cows for fear the vitality of the calf will be weakened. I belong to the large majority who want the dam to have the highest record possible, other things being equal. I do not expect more than a few of her close descendants will inherit this high quality but the chances are better for them to average up well than they would be from a cow of lower productive capacity.

There is a general belief among breeders that the characteristics of the dam of the sire are transmitted stronger to his daughters than are the characteristics of any other single animal among the ancestors. How much there is in this belief I am not prepared to say.

Next in importance to the dams' records comes the records of the sires' daughters. If the bull has sired many high testing daughters it is a good evidence but not certain that his son will also transmit these characters. Third in importance comes the grand dams, and so on through the pedigree. The pedigree of



Guernsey Bull.

Lorne of Meridale is a good example of a pedigree strong in records and having every indication a pedigree can show that these characters will be transmitted as proved to be the case. The pedigree of Hugorotus shows only three tested cows of which only one is as close as the third generation. The judgment that would be passed upon these two bulls from a study of their pedigrees would be the same as was the results in actual trial. It must not be expected, however, that the pedigree will always be as accurate an index of the value of the animal as it is in this case.

It should be kept in mind always that it is much more important to have a good animal for parent than a noted animal back in the third or fourth generation. I frequently hear men speak of having a Golden Lad, a Stoke Pogis or a DeKol bull, and when you examine the pedigree the animal mentioned is found in the third or fourth generation, which means they consider the most important fact about the bull to be the 6¼ or 12½ per cent of the blood of the noted bull he may carry. The close ancestors are the ones that count.

Care should be taken to discriminate between official records and private records of milk and butter production, especially where the latter are churn tests that test the ability of the butter maker as much as the butter production of the cow. An official record means what it says and so do many private records but there is always an element of uncertainty about the latter that detracts from their value.

Much more attention should be given to yearly records than to those covering seven days. Of course there are other things to be taken into account in buying a young bull, but I believe the records of the ancestors are of first consideration. In buying a bull of any age of course we require an animal of good conformation, strong vitality and constitution and good breed characteristics. In buying a young bull I want one from a cow medium to large for the breed. She must have been a regular breeder and a cow of strong constitution and vitality. She must have a well developed, symmetrical udder and teats, and a large official year's milk and butter test.

While most dairymen favor the selection of a young bull as a herd bull, there always is the uncertainty about how he will transmit the dairy characteristics. There is a more certain but more difficult way to get a bull that will transmit the desired characteristics. This is to get an old tested bull, one who has sired daughters of merit and showed himself to be the exceptional animal wanted by every breeder.

The most skilled breeders are always on the lookout for such an animal but many are never discovered and many others only after it is too late. Whenever possible it is always advisable to retain an old bull until the results of his breeding can be ascertained. Then if not satisfactory, the sooner he is gone the better, but there is always a chance of finding a bull like Missouri Rioter 3rd, previously mentioned.

The wonderful prepotency of Stoke Pogis 3rd was not recognized until he had been sold for beef. Hengerveld DeKol, the great Holstein bull that recently died, on the other hand was retained until it was discovered that he was one of the great bulls of the breed and as a result was sold for $1,500.00 at nine years of age for breeding purposes.

One of the great unnecessary losses among the dairymen is the sacrifice of the bulls when they are mature and at their best. The average dairyman buys a young bull, uses him two or three years and offers him for sale without waiting to learn of the quality of his daughters. His neighbor instead of buying the old bull buys a young one and the older one that may be worth a fortune to the community is sold for beef while the neighbor is experimenting with the young one.

There is one danger connected with the aged bull that should be understood and guarded against. This is the introduction of contagious abortion. If I had a herd free from this disease, I would exert the greatest precaution about introducing an aged bull. If I was not entirely satisfied on this point I would select the young calf which is safe from abortion even if coming from a herd where the disease exists.

DISCUSSION.

Prof. Eckles: When you hear a man speaking of a dairy bull and what his ancestors did way back in third and fourth generations, you might ask him if he knows his own ancestors that far back, and you will find that very likely his doesn't even know their names. The close ancestor is the one that counts, especially the first and second generation.

This question of the getting of a tested bull, one that had demonstrated his worth as a breeder, is coming to be of more and more importance in breeding operations. I believe the time will come when in some way we will make systematic efforts to test animals before we use them in a valuable herd. We have recently adopted a plan that will enable us to keep track on our grade bulls. We are not going to sell our grade bulls in the future. They bring but very little money and we have adopted a plan of farming them out and keeping them for a number of years, until we find out what kind of daughters they have sired. We are not going to run a chance of losing such bulls as these two, as we have done in the past. If we have a good bull, we will have a string on him so we can get him back again. We don't propose to lose track of him.

Mr. Cunningham: You speak of conformation and pedigree; which would you place the greater consideration on, or which do you consider the more valuable, the conformation of this sire or the pedigree behind him?

Prof. Eckles: In the case of the dairy animal, I would say without any hesitation the pedigree back of him, and by that I mean the record.

The Chairman: That is, the pedigree based on production.

Prof. Eckles: Yes, not necessarily who his grandsires were, but the records of production.

The Chairman: We will have to close this discussion.

The next topic is an address by Prof. H. C. Wing, of Cornell University, from our great dairy competitor, the State of New York. I now take pleasure in introducing to this audience Prof. Wing.

ADDRESS.

PROF. H. C. WING, Cornell University, N. Y.

Mr. President, Ladies and Gentlemen:—I am sure it is worth the journey from Ithaca, if nothing more occurred, than your wonderful yell. I noticed Col. Harris was brave enough to reply, but Prof. Eckles was not, and I shall follow in his footsteps. But if you really want to know what the Cornell yell is like, just get Dean Henry and Dr. Babcock off in a corner sometime, and they will let you know.

Some of you were perhaps at the meeting of the Guernsey Breeders yesterday afternoon and you will remember that what

I said there indicates that I was not from Missouri. I didn't have the temerity to make any such sort of an estimate of the value of a good bull as Prof. Eckles has. I was a little afraid to say even $400 before you. He says a good bull is worth $4,000. I hope the price of good dairy bulls has gone up in Wisconsin, at least 100 per cent, in the last twenty-four hours.

Now, you have discovered that we professors are very fond of having figures behind us to help out in our speeches. We are not all born orators, like the Senator from Kansas, and so we have to rely on something more tangible, and I hope you will excuse me for a few minutes while I take down Prof. Eckles' tables and put some in their place, not necessarily because they are better, but because they are different and because they are my text.

The few thoughts that I hope to present to you today are based very largely upon the records that have been secured through the system of official testing of cows in the dairy breeds in the last fifteen years, and since the Holstein Breeders' Association was the first to take up this work in a systematic way, they have naturally furnished us the largest amount of data. Without going into the question of the usefulness of the system of advanced registry testing as it is at present carried on, it may be well to remind you that advanced registry testing is used for two main purposes: First, to determine the actual value of the cow tested, herself, as a working machine; and second, to give a basis for selection among animals for breeding purposes, and from the pure bred standpoint of course it is the latter use that is of by far the greater importance.

Now, it will probably have occurred to you that the use of the advanced registry records as a basis for selection is simply the old fashioned axiom, find out which are the best and breed from them. But the question of deciding which animal is the best for breeding purposes, is perhaps not so simple a one as would appear on the outside, and it may in many cases depend upon other things rather than the mere kind of a record that the animal has made, and this too, without going into the question of the relative usefulness of long time and short time tests.

I am free to admit, as I think are most, that the system of advanced registry testing is far from complete, particularly with the Holstein breed, because, so large a part of it has, practically

NUMBER AND VALUE OF LIVE STOCK—Continued.

Counties.	Horses of all Ages.		Sheep and Lambs.		Swine 4 months old or over.	
	No.	Value.	No.	Value.	No.	Value.
Sauk	13,503	916,049	17,556	48,500	21,683	126,438
Sawyer	875	44,573	91	216	251	1,132
Shawano	9,463	590,533	11,184	23,176	10,150	36,283
Sheboygan	12,518	912,070	2,440	7,225	12,965	62,989
Taylor	2,425	120,379	781	1,639	711	2,453
Trempealeau	11,444	814,376	28,199	79,401	11,094	67,965
Vernon	12,141	767,454	29,372	92,845	13,284	72,627
Vilas	622	31,100	69	207	119	595
Walworth	13,091	838,845	10,957	47,328	17,650	109,579
Washburn	2,101	67,439	2,234	3,768	921	3,188
Washington	9,968	670,797	6,694	25,131	12,104	61,377
Waukesha	12,124	692,619	17,325	40,303	7,301	40,921
Waupaca	11,155	791,543	7,037	18,584	8,279	46,855
Waushara	6,402	413,392	3,199	8,028	5,579	34,379
Winnebago	10,424	819,033	9,496	27,213	10,632	61,276
Wood	3,922	194,579	2,363	3,924	2,586	9,364
Total	545,604	$35,059,145	591,975	$1,691,083	604,136	$3,221,083

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Bushels.		
	Wheat.	Corn.	Oats.
Adams	3,760	333,730	226,080
Ashland	5,824	2,200	32,685
Barron	15,712	81,110	631,880
Bayfield	490	425	6,680
Brown	47,542	92,600	938,669
Buffalo	91,968	508,475	999,735
Burnett	40,499	41,697	128,496
Calumet	18,454	273,950	424,951
Chippewa	14,850	219,457	1,048,080
Clark	19,927	134,392	513,920
Columbia	23,126	1,316,124	1,327,246
Crawford	32,745	391,567	419,629
Dane	10,315	2,081,265	1,805,296
Dodge	79,231	1,412,100	1,775,475
Door	49,774	23,300	252,356
Douglas	1,195	4,768	8,753
Dunn	62,202	1,115,380	1,188,275
Eau Claire	70,712	252,580	1,047,762
Florence	1,002	571	27,947
Fond du Lac	10,564	712,688	1,332,256
Forest	216	90	10,115
Grant	17,537	1,941,394	1,354,851
Green	5,562	1,275,659	726,908
Green Lake	18,303	780,775	698,041
Iowa	10,335	790,048	825,280
Iron	1,323	....	7,533
Jackson	52,342	336,436	739,358
Jefferson	63,846	1,045,698	888,298
Juneau	16,390	277,643	554,856
Kenosha	6,012	394,941	410,228
Kewaunee	54,048	535	501,173
La Crosse	24,778	401,757	684,573
La Fayette	2,140	1,153,202	725,591
Langlade	3,237	6,114	160,535
Lincoln	1,026	975	170,965
Manitowoc	46,624	62,972	657,971
Marathon	56,093	67,740	885,485
Marinette	6,472	27,405	111,976
Marquette	5,180	473,585	609,319
Milwaukee	8,450	171,001	284,006
Monroe	43,862	463,275	1,038,774
Oconto	19,651	170,591	315,601
Oneida	733	420	21,402
Outagamie	6,444	713,381	1,736,746
Ozaukee	16,392	170,910	377,378
Pepin	20,212	222,622	224,778
Pierce	60,870	191,263	960,290
Polk	33,561	127,270	963,549
Portage	3,432	358,916	598,571
Price	402	1,100	25,494
Racine	7,335	656,720	446,213
Richland	10,811	653,865	833,283
Rock	8,232	1,808,983	770,728
Rusk	952	9,504	19,611
St. Croix	33,518	245,016	1,785,281

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Bushels.		
	Wheat.	Corn.	Oats.
Sauk	55,481	1,081,687	1,253,145
Sawyer	1,195	990	15,783
Shawano	47,010	255,128	533,405
Sheboygan	15,443	370,671	816,658
Taylor	471	2,985	60,567
Trempealeau	125,197	515,580	1,792,193
Vernon	44,602	476,578	745,623
Vilas	165	640	11,489
Walworth	9,896	1,664,801	737,911
Washburn	8,426	21,320	60,644
Washington	49,612	534,642	666,314
Waukesha	29,477	685,530	772,659
Waushara	3,509	435,717	378,812
Waupaca	14,042	455,585	758,733
Winnebago	15,763	554,146	897,655
Wood	2,514	84,543	204,293
Total	1,699,137	31,108,835	43,860,874

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Bushels.		
	Barley.	Rye.	Flax seed.
Adams	14,209	134,594	....
Ashland	4,301	1,700	20
Barron	64,644	10,557	594
Bayfield	615	38	....
Brown	400,067	133,851	96
Buffalo	375,149	31,856	462
Burnett	5,636	6,255	....
Calumet	596,127	78,805	9
Chippewa	68,420	29,696	806
Clark	79,808	22,292	572
Columbia	344,040	89,023	30
Crawford	52,850	6,245	....
Dane	517,862	24,800	50
Dodge	1,828,072	27,430	13
Door	82,061	92,340	338
Douglas	323	600	....
Dunn	198,692	45,571	234
Eau Claire	121,139	59,813	1,000
Florence	1,315	180	....
Fond du Lac	974,888	7,656	396
Forest	942	....	....
Grant	211,641	24,465	30
Green	277,155	20,896	....
Green Lake	204,467	53,754	140
Iowa	116,255	....	....
Iron	483	....	....
Jackson	60,090	41,338	145
Jefferson	267,391	58,120	....
Juneau	59,909	47,985	15
Kenosha	42,578	30,992	301
Kewaunee	174,397	81,801	699
La Crosse	206,213	39,362	....
Lafayette	183,109	3,640	....
Langlade	32,298	4,644	22
Lincoln	12,125	2,254	....
Manitowoc	582,211	178,852	1,143
Marathon	144,191	28,776	1,259
Marinette	17,397	13,428	8,428
Marquette	5,368	149,572	....
Milwaukee	85,070	31,255	....
Monroe	170,809	51,898	62
Oconto	43,939	28,319	....
Oneida	1,122	203	....
Outagamie	373,716	29,200	8
Ozaukee	353,173	29,872	371
Pepin	146,285	39,247	....
Pierce	494,653	109,731	8,678
Polk	120,414	11,690	2,563
Portage	8,699	141,203	30
Price	2,576	570	....
Racine	78,776	34,884	1,580
Richland	128,887	9,504	....
Rock	167,419	117,801	....
Rusk	3,171	860	....
St. Croix	311,065	84,807	68,676

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Bushels.		
	Barley.	Rye.	Flax seed.
Sauk	163,728	181,120	74
Sawyer	390	247	....
Shawano	144,601	42,851	54
Sheboygan	586,008	70,683	192
Taylor	8,172	2,521	8
Trempealeau	189,555	71,714	854
Vernon	143,257	2,808	430
Vilas	300	150	....
Walworth	480,013	34,920	....
Washburn	5,738	2,017	....
Washington	759,354	52,418	10
Waukesha	326,062	119,284	27
Waushara	11,560	137,949	1,040
Waupaca	100,780	84,944	52
Winnebago	322,701	15,095	219
Wood	39,502	27,595	211
Total	14,072,923	3,149,486	95,572

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Bushels.		
	Potatoes.	Beans.	Cranberries.
Adams	545,044	1,079	....
Ashland	2,200	....	....
Barron	462,414	1,357	300
Bayfield	33,635	....	....
Brown	286,374	150	....
Buffalo	83,341	4	....
Burnett	115,223	....	190
Calumet	63,306	16	....
Chippewa	553,383	263	25
Clark	222,783	44	....
Columbia	603,775	61,004	....
Crawford	61,272	30	....
Dane	217,272	6,221	12
Dodge	197,210	361	....
Door	175,858	719	....
Douglas	60,257	5,885	....
Dunn	436,090	246	....
Eau Claire	215,776	694	....
Florence	18,217	....	....
Fond du Lac	261,978	69	6
Forest	13,275	3	....
Grant	157,915	22	....
Green	66,121	....	....
Green Lake	127,467	12,492	....
Iowa	79,413	145	....
Iron	7,210	....	1,000
Jackson	99,199	2,105	18,905
Jefferson	94,868	....	....
Juneau	352,724	....	5,170
Kenosha	82,783	....	....
Kewaunee	64,444	208	....
La Crosse	119,546	....	....
Lafayette	73,878	....	....
Langlade	89,258	21	20
Lincoln	85,149	5	....
Manitowoc	137,612	837	1
Marathon	300,438	122	40
Marinette	139,872	530	....
Marquette	380,295	20,190	1,137
Milwaukee	228,117	2,157	....
Monroe	192,447	66	6,587
Oconto	168,779	1,436	....
Oneida	47,924	....	....
Outagamie	422,613	....	....
Ozaukee	992,501	11	....
Pepin	38,821	6	....
Pierce	101,016	185	....
Polk	203,748	129	48
Portage	1,891,998	96	175
Price	672,938	17	8
Racine	132,310	20	....
Richland	73,020	8	....
Rock	181,612	18	....
Rusk	45,585	236	....
St. Croix	173,981	9	....

STATEMENT OF CROPS GROWN IN 18[illegible]—Continued.

Counties.	Number of Bushels.		
	Potatoes.	Beans.	Cranberries.
Sauk	[illegible]		
Sawyer	[illegible]		
Shawano	[illegible]	[illegible]	
Sheboygan	[illegible]	[illegible]	
Taylor	[illegible]	[illegible]	
Trempealeau	[illegible]	[illegible]	
Vernon	[illegible]	[illegible]	
Vilas	[illegible]		
Walworth	[illegible]		
Washburn	[illegible]	[illegible]	[illegible]
Washington	[illegible]	[illegible]	
Waukesha	[illegible]	[illegible]	
Waupaca	[illegible]	[illegible]	[illegible]
Waushara	[illegible]	[illegible]	
Winnebago	[illegible]	[illegible]	[illegible]
Wood	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Bushels.			
	Apples.	Strawberries	Raspberries.	Blackberries.
Adams	1,146	....	14	20
Ashland	382	124	....	....
Barron	949	343	155	....
Bayfield	288	114	....	....
Brown	17,658	2,335	272	5
Buffalo	341	....	....	....
Burnett	116	109	....	....
Calumet	16,619	1	....	....
Chippewa	5,710	685	126	3
Clark	2,315	228	....	40
Columbia	13,726	477	92	62
Crawford	31,295	1,008	215	375
Dane	14,935	1,069	268	51
Dodge	25,170	2,683	471	257
Door	30,160	2,394	339	60
Douglas	55	1,842	155	....
Dunn	3,543	1,202	51	6
Eau Claire	6,255	6,570	1,031	900
Florence	708	....	....	....
Fond du Lac	27,131	484	115	285
Forest	....	....	....	....
Grant	22,934	611	424	211
Green	2,778	48	68	94
Green Lake	5,595	138	60	1
Iowa	5,128	19	3	....
Iron	....	....	....	....
Jackson	4,558	4,698	874	1,161
Jefferson	10,744	158	....	....
Juneau	4,858	40	40	10
Kenosha	8,024	2,428	1,252	35
Kewaunee	16,790	....	....	....
La Crosse	13,503	3,488	795	1,833
Lafayette	1,654	97	197	....
Langlade	250	725	....	....
Lincoln	357	166	....	....
Manitowoc	39,848	731	61	1,265
Marathon	5,259	279	35	....
Marinette	8,448	....	....	....
Marquette	5,407	293	191	10
Milwaukee	12,529	7,635	189	29
Monroe	15,319	21,051	2,744	3,8[illegible]8
Oconto	17,377	....	....	....
Oneida	....	132	....	....
Outagamie	29,370	315	380	1,2[illegible]5
Ozaukee	25,134	102	25	12
Pepin	2,921	174	55	....
Pierce	3,275	94	....	....
Polk	139	172	9	....
Portage	2,849	164	5	6
Price	193	133	....	....
Racine	2,594	4,165	....	....
Richland	26,642	415	20	125
Rock	3,107	2,314	793	172
Rusk	212	1,000	40	....
St. Croix	822	3,194	1,578	....

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Bushels.			
	Apples.	Strawberries.	Raspberries.	Blackberries.
Sauk	24,405	1,289	635	830
Sawyer	....	40	....	....
Shawano	16,213	26	....	....
Sheboygan	57,775	708	104	38
Taylor	224	30	....	....
Trempealeau	12,541	903	74	67
Vernon	34,938	139	92	213
Vilas	....	....	....	....
Walworth	6,434	532	34	10
Washburn	290	198	34	....
Washington	46,636	525	85	6
Waukesha	18,210	19,350	383	75
Waushara	5,587	153	161	....
Waupaca	17,313	122	27	25
Winnebago	35,128	2,725	79	40
Wood	1,076	303	32	87
Total	774,940	103,842	15,437	13,292

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Bushels.			
	Currants.	Grapes.	Clover seed.	Timothy seed.
Adams	...	...	1,523	236
Ashland	...	...	...	...
Barron	...	...	3,483	65
Bayfield	...	...	...	...
Brown	594	2	2,011	149
Buffalo	...	...	1,121	971
Burnett	...	...	531	...
Calumet	...	...	6,837	93
Chippewa	...	3	1,062	601
Clark	96	...	94	14
Columbia	31	12	1,485	10,803
Crawford	6	20	168	430
Dane	46	17	779	2,330
Dodge	24	52	2,480	828
Door	...	...	252	80
Douglas	25	...	...	15
Dunn	1	29	3,687	3,105
Eau Claire	44	1	3,452	888
Florence	...	...	...	...
Fond du Lac	19	80	2,021	331
Forest	...	...	...	3
Grant	20	1,030	1,585	3,500
Green	20	30	125	1,203
Green Lake	4	5	2,879	1,431
Iowa	...	...	161	356
Iron	...	...	...	...
Jackson	66	115	3,932	229
Jefferson	...	243	293	84
Juneau	...	...	3,289	69
Kenosha	65	...	61	226
Kewaunee	...	...	2,725	294
La Crosse	61	1,130	89	45
Lafayette	...	...	512	2,075
Langlade	...	...	...	...
Lincoln	1	...	...	10
Manitowoc	53	3	7,904	2,364
Marathon	...	...	307	37
Marinette	...	...	41	...
Marquette	53	...	4,811	37
Milwaukee	1,359	30	98	...
Monroe	15	192	507	91
Oconto	...	...	87	...
Oneida	2	...	20	11
Outagamie	13	...	515	20
Ozaukee	10	...	2,292	35
Pepin	...	...	1,817	591
Pierce	...	...	215	108
Polk	...	...	109	3
Portage	1	1	277	1,050
Price	5	...	...	1
Racine	...	10	161	318
Richland	...	643	61	241
Rock	508	60	1,038	5,512
Rusk	...	...	255	...
St. Croix	200	...	261	578

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Bushels.			
	Currants.	Grapes.	Clover seed.	Timothy seed.
Sauk	47	82	1,438	703
Sawyer				
Shawano			593	52
Sheboygan	5	3	3,013	120
Taylor			29	30
Trempealeau	4	2,000	2,718	1,223
Vernon	11	180	782	662
Vilas				
Walworth	16		285	1,512
Washburn			35	20
Washington	45		8,553	82
Waukesha	574	146	561	217
Waushara			1,476	103
Waupaca			326	192
Winnebago	71	4	578	305
Wood	237		66	
Total	4,355	6,132	87,911	46,797

STATEMENT OF CROPS GROWN IN 1907.

Counties.	Number of Tons.		
	Sugar beets.	Hay.	Cabbages.
Adams	144	12,930	
Ashland		9,926	15
Barron	1,341	61,513	
Bayfield		4,982	
Brown	6,024	44,639	
Buffalo	10	39,438	
Burnett		14,463	
Calumet	2,359	29,447	
Chippewa	3,139	63,960	
Clark	129	111,600	
Columbia	714	49,294	
Crawford	473	35,789	
Dane	7,942	148,025	
Dodge	1,050	56,621	
Door	2,396	28,316	
Douglas		4,810	
Dunn	737	58,683	
Eau Claire	359	36,621	
Florence		4,819	
Fond du Lac	500	56,644	
Forest	138	1,998	
Grant	98	85,590	
Green	2,000	67,458	
Green Lake	1	14,081	
Iowa		74,325	
Iron		1,611	
Jackson	131	26,502	
Jefferson	2,241	38,911	
Juneau	5,276	22,485	
Kenosha	116	34,581	
Kewaunee	888	32,226	
La Crosse	1	34,078	
La Fayette		68,458	
Langlade		19,816	
Lincoln		12,813	
Manitowoc		64,881	
Marathon	531	83,434	
Marinette	1,693	12,560	
Marquette		8,834	
Milwaukee	3,878	31,207	4,143
Monroe	183	54,205	
Oconto	8,793	23,074	
Oneida		9,394	
Outagamie	3,438	41,875	220
Ozaukee	2,404	30,677	
Pepin	51	11,169	
Pierce	127	37,276	
Polk	425	65,256	
Portage	27	29,568	
Price		13,609	
Racine	17,225	33,560	12,155
Richland		58,977	
Rock	16,532	68,836	
Rusk	2	7,760	
St. Croix	158	48,886	

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Tons.		
	Sugar beets.	Hay.	Cabbages.
Sauk	283	60,224	....
Sawyer	....	3,471	....
Shawano	2,677	31,101	....
Sheboygan	302	56,646	....
Taylor	....	15,089	....
Trempealeau	432	50,080	....
Vernon	1,327	70,723	....
Vilas	....	969	....
Walworth	559	68,905	....
Washburn	75	7,909	....
Washington	5,365	35,054	....
Waukesha	6,235	69,725	....
Waushara	....	17,496	....
Waupaca	1,135	38,238	....
Winnebago	496	45,908	....
Wood	1,061	26,488	....
Total	108,676	2,738,383	16,533

STATEMENT OF CROPS GROWN IN 1907

Counties.	Number of Pounds.			Acres Harvested for Seed.	
	Flax fiber.	Hops.	Tobacco.	Clover.	Timothy.
Adams			6,500	1,479	61
Ashland					
Barron			77,010	839	51
Bayfield					
Brown	5		4,000	1,414	85
Buffalo			91,100	577	377
Burnett					
Calumet				3,196	22
Chippewa			368,160	281	177
Clark			22,100	15	11
Columbia			3,088,902	1,150	1,712
Crawford			2,702,625	29	23
Dane		6	14,492,761	442	1,014
Dodge			10,920	1,159	109
Door			607	168	10
Douglas			100		
Dunn	100,111		575,440	1,486	353
Eau Claire	14,800	1	48,925	1,693	209
Florence					
Fond du Lac				1,093	163
Forest					
Grant			333,400	1,728	818
Green			798,600	115	4,415
Green Lake		2,200		1,700	179
Iowa				135	66
Iron					
Jackson			194,600	1,161	59
Jefferson			259,000	293	18
Juneau			533,393	1,662	18
Kenosha	10,000			22	29
Kewaunee			275	2,999	43
La Crosse			55,460	76	11
La Fayette				150	329
Langlade					
Lincoln					
Manitowoc				7,904	2,61
Marathon			4,000	307	37
Marinette				41	
Marquette			613	3,472	31
Milwaukee				69	
Monroe		300	648,869	264	
Oconto				76	16
Oneida				13	
Outagamie				228	3
Ozaukee				1,194	7
Pepin				1,221	104
Pierce			3,654	224	107
Polk	6,000				
Portage				187	255
Price					
Racine				80	37
Richland			271,265	31	73
Rock			7,128,070	491	1,157
Rusk			2,050	64	
St. Croix			1,500	158	121

STATEMENT OF CROPS GROWN IN 1907—Continued.

Counties.	Number of Pounds.			Acres Harvested for Seed.	
	Flax fiber.	Hops.	Tobacco.	Clover.	Timothy.
Sauk	....	4,000	25,100	836	116
Sawyer	....	....	....	....	....
Shawano	....	....	....	573	76
Sheboygan	....	....	....	1,032	32
Taylor	....	....	....	....	....
Trempealeau	1,500	....	550,538	1,118	151
Vernon	....	....	5,867,268	633	83
Vilas	....	....	....	....	....
Walworth	....	....	20,501	261	324
Washburn	....	....	....	....	....
Washington	....	....	....	3,478	116
Waukesha	....	....	20,000	367	129
Waushara	....	....	17,196	....	....
Waupaca	....	....	....	320	94
Winnebago	....	....	....	278	50
Wood	....	....	500	39	413
Total	414,416	6,507	38,225,102	51,142	16,323

SIXTEENTH ANNUAL MEETING

OF THE

WISCONSIN
Cheese Makers' Association

HELD IN THE

Freie Gemeinde Hall, Milwaukee, Wisconsin, Wednesday,
Thursday and Friday, January 8, 9 and 10, 1908.

Report of the Proceedings, Annual Address of the President, and
Interesting Essays and Discussions Relating
to the Cheese Interests.

Compiled by
U. S. BAER, Secretary.
MRS. M. G. CARPENTER, Stenographic Reporter.

MADISON, WIS.
DEMOCRAT PRINTING COMPANY, STATE PRINTER
1908

LETTER OF TRANSMITTAL.

Office of the Secretary,
Wisconsin Cheese Makers' Association,
Madison, Wis. 1908.

To His Excellency. James O. Davidson,
Governor of the State of Wisconsin:

I have the honor to submit the sixteenth annual report of the Wisconsin Cheese Makers' Association, showing the receipts and disbursements the past year, also containing the papers, addresses and discussions had at the annual convention held at Milwaukee, January 8–10, 1908.

Respectfully submitted,
U. S. BAER,
Secretary.

OFFICERS, 1908.

President:—

J. B. McCREADY..............................Green Bay, Wis.

Vice President:—

FRED MARTY..................................Monroe, Wis.

Directors:—

Three Years—F. J. KARLEN......................Monroe, Wis.
Two Years—J. W. CROSS........................Mauston, Wis.
One Year—J. D. CANNON.....................New London, Wis.

Treasurer:—

F. E. CARSWELL........................Richland Center, Wis.

Secretary:—

U. S. BAER...................................Madison, Wis.

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ARTICLES OF INCORPORATION

OF THE

Wisconsin Cheese Makers' Association

(Adopted February 2, 1899.)

ARTICLE I.

The undersigned have associated and do hereby associate themselves together for the purpose of forming a corporation under Chapter 86 of the Wisconsin statutes of 1898 and the acts amendatory thereof and supplementary thereto, the business, purpose, and object of which corporation shall be the education of its members for better work in the art of making cheese, the care and management of factories, the sale of their products and the weeding out of incompetency in the business of cheese making; the further object of the corporation is to demand a thorough revision and rigid enforcement of such laws as will protect the manufacture of honest dairy products against undue competition from deceitful and dangerous imitations; and to unite the rank and file of its members in instituting a regular crusade against the unjust practice of pooling milk at cheese factories by weight, without regard to the butter fat which it contains.

ARTICLE II.

This corporation shall be known as the "Wisconsin Cheese Makers' Association," and its principal office and location at Madison, Wisconsin.

ARTICLE III.

The association shall be a corporation without capital stock. Any person who is a practical cheese maker, and such other persons as are directly or indirectly interested in the manufacture and sale of unadulterated cheese may become members of this corporation by paying one dollar annually in advance and signing the roll of membership.

ARTICLE IV.

Section 1. The general officers of said association shall consist of a president, vice-president, secretary, and treasurer and the board of directors shall consist of three members of the association.

Section 2. The term of the officers of the association shall be one year or until their successors are elected at the next annual meeting following their election, and until such successors qualify. At the first meeting of the members of the association there shall be elected a director for the term of one year, a director for the term of two years, and a director for the term of three years, and thereafter there shall be elected at each annual meeting, a director for the term of three years, and each director shall hold his office until his successor is elected and qualifies. The election of officers and directors shall be by ballot, execpt in case of a single nominee, when election by acclamation may be substituted. A majority of all the votes cast shall decide an election.

ARTICLE V.

Section 1. The principal duties of the president shall be to preside at all meetings of the Board of Directors and of the members of the association during his term of office. He shall appoint special committees and sign all orders drawn on the treasurer. He shall appoint a committee on resolutions and a program committee. He shall also provide for suitable medals at the expense of the association.

Section 2. The vice president shall assume the duties of the president in the latter's absence.

Sectio 3. The principal duties of the secretary of this association shall be to keep a complete and accurate record of the proceedings of the Board of Directors and of the association and to attend all meetings, keep a correct account of the finances received, pay all moneys into the hands of the treasurer and receive his receipt therefor, and to countersign all orders for money drawn upon the treasurer. He shall keep a record book and suitable blanks for his office. He shall make a full and complete report at each annual meeting of the correct state of the finances and standing of the association. He shall also procure certificates of membership, and every person joining the association shall receive one signed by the president and countersigned by the secretary.

Section 4. The principal duties of the treasurer shall be to faithfully care for all moneys entrusted to his keeping, paying out the same only on receipt of an order signed by the president and countersigned by the secretary. He shall file with the secretary of the association all bonds required by the articles of incorporation or the by-laws. He shall make at the annual meeting a detailed statement of the finances of the corporation. He must keep a regular book account, and his books shall be open to inspection at any time by any member of the association.

Section 5. The Board of Directors shall be the Executive committee and shall audit the accounts of the secretary and treasurer, and present a report of the same at the annual meeting; Executive committee shall procure a place to hold the meeting and make arrangements for Reception committees, hotel rates, halls, and all necessary preliminary arrangements for each and every meeting.

Section 6. The committee on programs shall make all arrangements for the proper working of the conventions, assigning all subjects, arranging for speakers, and make the division of time allowed to the discussion of each topic, to determine upon the time for the election of officers, conducting business meetings, and any other matters that may properly come under this division.

Section 7. The committee on resolution shall draw up such resolutions as the exigencies of the time may require and which shall express the sense of the association.

Section 8. The said officers shall perform such additional or different duties as shall from time to time be imposed or required by the members of the corporation in annual meeting, or by the Board of Directors, or as may be prescribed from time to time by the by-laws, and any of the duties and powers of the officers may be performed or exercised by such other officers or officer, or such person or committee as the corporation or Board of Directors may authorize.

ARTICLE VI.

The treasurer of the corporation shall give a bond in the sum of one thousand dollars with two sureties, for the faithful performance of his duties.

ARTICLE VII.

These articles may be altered or amended at any regular session of an annual meeting of the members, provided the proposed alterations or amendments shall have been read before the association at least twenty-four hours previously, and provided also that such alterations or amendments shall receive a two-thirds vote of the members present.

ARTICLE VIII.

The first meeting of this association for the election of officers and directors shall be held on the 3d day of February, 1901, and such corporation shall hold a meeting of its members annually during each calender year at such time as may be determined by the Board of Directors.

MEMBERS OF WISCONSIN CHEESE MAKERS' ASSOCIATION, 1908.

A

Aldrich, M. B.	De Pere	Wisconsin
Assenbauer, Mike	Theresa	Wisconsin
Altman, J. F.	Blenker	Wisconsin
Albrecht Bros. & Co	Kewaunee	Wisconsin
Anderegg, Casper	La Crosse	Wisconsin
Ackerman, Henry	Manitowoc, R. 3	Wisconsin
Adams, M. J.	Waukesha	Wisconsin
Anderson, H.	Sheboygan Falls	Wisconsin
Austin, H. E.	Boscobel	Wisconsin
Ackerman, Joseph	Monroe	Wisconsin
Ast, Ben	Dodgeville	Wisconsin
Alexander, C. B.	Chicago, Star Union Line	Illinois
Aderhold, E. L.	Neenah	Wisconsin

B

Baer, U. S.	Madison	Wisconsin
Brinkman, C. F.	Coon Valley, R. 1	Wisconsin
Bergs, Joseph	Edgar, R. 2	Wisconsin
Bymers, John	Vesper	Wisconsin
Best, C. E.	Franklin	Wisconsin
Beck, G. E.	Linden	Wisconsin
Bennin, Chas. A	New Holstein	Wisconsin.
Bartz, H. F.	Suring, R. 1	Wisconsin
Bonikowske, Louis	Odgenburg	Wisconsin
Benkendorf, G. H	Madison	Wisconsin
Bagley, Frank R.	Chicago, 40 Dearborn St.	Illinois
Bean, Geo. W.	Green Bay, R. 8	Wisconsin
Benishek, Anton	Kellnersville, R. 2	Wisconsin
Bornfleth, R.	Burnett Jct	Wisconsin

Bauer, Fred	Chilton	Wisconsin
Bois, A. F	Osceola	Wisconsin
Becker, Phil	Hubertus	Wisconsin
Bender, Fred	Boaz	Wisconsin
Bennett, Andrew	Belmont	Wisconsin
Barron, Frank	Fond du Lac, R. 2	Wisconsin
Burchard, G. W	Fort Atkinson	Wisconsin
Bruhn, Aksel	Spring Green, R. 1	Wisconsin
Bahr, C. A	New Holstein, R. 3	Wisconsin
Bahr, Ed. M	Sheboygan Falls	Wisconsin
Borchart, Albert	Wayside	Wisconsin
Biddulph, J. R	Tiskilwa	Illinois
Baker, Wm. D	Kiel, R. 1	Wisconsin
Brinkman, Ed. C	Plymouth, R. 25	Wisconsin
Bartelt, John	Allenton, R. 1	Wisconsin
Bruik, A	Sawyer, R. 3	Wisconsin
Bamford, H. J	Plymouth	Wisconsin
Baertschi, Fred	Mayville	Wisconsin
Blood, Fred	Winnetke	Illinois
Blessig, L. W	Milwaukee, Penn. Ry. Co.	Wisconsin
Brickhaus, S. N	Chicago, 184 E. Kinzie St.	Illinois
Bates, R. R	Madison, 137 E. Johnson St.	Wis.
Brandt, A. K	Plymouth, R. 27	Wisconsin
Becker, Henry	Richfield, R. 2	Wisconsin
Bilgrien, H	Iron Ridge	Wisconsin

C

Chilsen, Knudt	Merrill, R. 5	Wisconsin
Cross, Avery A	Mauston	Wisconsin
Cross, J. W	Mauston	Wisconsin
Carswell, F. E	Richland Center	Wisconsin
Cannon, J. D	New London	Wisconsin
Combs, Frank	Merrill	Wisconsin
Cranston, P. E	Sabin	Wisconsin
Cook, Hon. S. A	Neenah	Wisconsin
Callies, R. H	Edgar, R. 1	Wisconsin
Carpenter, Fred H	Edgar, R. 1	Wisconsin
Cebell, R. A	Watertown	Wisconsin
Conrad, R	Haven	Wisconsin
Coulsom, E. H	Kewaunee	Wisconsin
Cannon, Sam	Neenah	Wisconsin
Chesak, W. J	West Bend, R. 2	Wisconsin
Chaplin, H. A	Plymouth	Wisconsin

Corneliuson, T	Eau Claire	Wisconsin
Criss, J. F	Chicago, 278 So. Water St.	Illinois
Chaplin, Erle	Plymouth	Wisconsin
Cook, S. A	Neenah	Wisconsin
Cornish, O. B	Ft. Atkinson	Wisconsin
Carver, C. A	Milwaukee, 114 Wis. St.	Wisconsin

D

Derfus, J. J.	Sherwood	Wisconsin
Dornstreich, Wm	Greenleaf, R. 3	Wisconsin
Douma, G	Cleveland	Wisconsin
Decker, A. J	Fond du Lac, 127 Gillett St.	Wis.
Draheim, John A	Hayton, R. 1	Wisconsin
Damrow, O. A	Sheboygan Falls, R. 7	Wisconsin
Dohnel, F. W	Oconto, R. 2	Wisconsin
Dixon, H. A	Clintonville	Wisconsin
Diekow, R. C	Cobb	Wisconsin
Damrow Bros	Fond du Lac	Wisconsin
Ditmar, John G	Kewaunee, R. 2	Wisconsin
Durst, Henry	Twin Bluffs, R. 1	Wisconsin
Durst L. A	Twin Bluffs, R. 1	Wisconsin
Dassow, R. P	Sheboygan Falls, R. 8	Wisconsin
Dodge, A. C	Lake Mills	Wisconsin
Deland, A. D	Sheboygan	Wisconsin
De Zotell, Frank A	Milwaukee (921 Ry. Exchange Bldg.)	Wisconsin
Dibble, C. A	Milwaukee Room 28 Chamber of Commerce Bld	Wisconsin
Dillon, H. P	Oshkosh, 146 Franklin Ave.	Wis.

E

Ebbens, Louis E	Thorp	Wisconsin
Elmslie, J. A	Milwaukee (24 Chamber of Commerce)	Wisconsin
Elmer, John H. & Son	Monroe	Wisconsin
Emery, J. Q	Madison	Wisconsin
Enright, John	Watertown	Wisconsin
Eichinger, Joseph	Sturgeon Bay, R. 2	Wisconsin
Ebert, Lornz	Bonduel	Wisconsin
Eide, Harry	Granton	Wisconsin
Ellfson, Henry	Spring Green	Wisconsin

Ehrlich, Otto	Sheboygan Falls, R. 10	Wisconsin
Ellsworth, C. R	Lone Rock	Wisconsin

F

Fennema, John	Ondega	Netherlands
Figred, Elias	Stavanger	Norway
Feun, Oscar A	Sheboygan Falls, R. 7	Wisconsin
Frank, Wm. J	Manitowoc, R. 4	Wisconsin
Fero, Walter	Stanley, R. 2	Wisconsin
Fischer, John	Boaz	Wisconsin
Freeman, Leonard	Fenton	Michigan
Furrer, Casper	Blanchardville	Wisconsin
Fischer, E. H	Waldo	Wisconsin
Fenner, Frank	Sheboygan Falls, R. 9	Wisconsin
Fehrmann, Aug	Whitelaw	Wisconsin
Falck, Louis	Morrison	Wisconsin
Fries, Anton	Glidden	Wisconsin
Fellenz, Joseph B	Kewaskum, R. 1	Wisconsin
Fassbender, H	Greenville	Wisconsin
Falk, J. W	Mayville	Wisconsin
Fisher, Geo. Jr	Spencer, R. 2	Wisconsin
Ferbend, F	Chicago, 71 So. Water St	Illinois
Frazer, G. W	Appleton	Wisconsin
Fulmer, F. B	Oshkosh	Wisconsin

G

Goodman, L. W	Cadott, R. 2	Wisconsin
Grootemont, John	Brillion	Wisconsin
Grimm, A	Tremont	Wisconsin
Gartman, A.	Edgar, R. 1	Wisconsin
Goeb, John H	Fond du Lac, 278 6th St.	Wisconsin
Good, Chas. H	Richland Center	Wisconsin
Goetschel, S. E	Cleveland	Wisconsin
Gartman, Chas	Sheboygan, R. 4	Wisconsin
Gruenke, O. F.	Clintonville, R. 2	Wisconsin
Gregorius, M. J	Appleton	Wisconsin
Gerner, R	Barton	Wisconsin
Green, R. C	Albion	Wisconsin
Gartman, F. W	Sheboygan, R. 4	Wisconsin
Gronert, R. F	Beaver Dam	Wisconsin

H

Hosig, Emil B	Mayville	Minnesota
Huffman, Howard	Richland Center	Wisconsin
Haskins, H. J	Madison	Wisconsin
Husar, Emil	Kellnersville, R. 1	Wisconsin
Hoffman, A. F	Stanley, R. 1	Wisconsin
Heckert, C. A	Chilton	Wisconsin
Harder, F. J	Hilbert, R. 5	Wisconsin
Helm, A. B	Oshkosh	Wisconsin
Holzmiller, John	Fennimore	Wisconsin
Hannawell, Freeman	Livingstone, R. 2	Wisconsin
Hahn, A. H	Sheboygan Falls, R. 8	Wisconsin
Hertel, Jacob	Chilton, R. 2	Wisconsin
Haugartner, J. J	Marion	Wisconsin
Hoeppner, John	Marion	Wisconsin
Hefty, Jacob	Mt. Horeb	Wisconsin
Haven, E. A	Bloomingdale	Michigan
Haag, Wm	Malone	Wisconsin
Hasse, Louis	Juneau, R. 1	Wisconsin
Hamm, Albert	West Bend, R. 3	Wisconsin
Howe, J. H	Spencer, R. 2	Wisconsin
Habhegger, John	Watertown, 110 Second St.,	Wis.
Huber, Joseph	Monroe	Wisconsin
Heublein, M. C	Fox Lake	Wisconsin
Hrusk, Andrew	Luxembourg, R. 3	Wisconsin
Hoesly, Fred	Bangor, R. 2	Wisconsin

I

Indermuhle, Henry	Theresa	Wisconsin
Indermuhle, Fred	Oakfield, R. 27	Wisconsin
Indermuhle, Carl	Knowles, R. 1	Wisconsin

J

Jaeger, John	Campbellsport	Wisconsin
Jozwick, John H	Hofa Park	Wisconsin
Jarchow, L	Forestville	Wisconsin
Johnston, Robert	Woodstock, Ontario, 39 Vansittart Ave.	Canada
Jennings, A. A.	Chicago, 4 Sherman St.	Illinois

K

Kane, James	Stanton	Wisconsin
Koehler, M. A.	West Bloomfield	Wisconsin
Kriewaldt, J. E.	Embarrass, R. 1	Wisconsin
Knudson, Oscar	Spring Green	Wisconsin
Kregel, L. C.	Larson, R. 15	Wisconsin
Kawai, Mataroku	Osaka	Japan
Kust, G. C.	Neillsville	Wisconsin
Kaeser, John	Monroe	Wisconsin
Kusel, L. H.	Watertown	Wisconsin
Karlen, F. J.	Monroe	Wisconsin
Karlen, Jacob	Monroe	Wisconsin
Karlen, Jacob Sr.	Monroe	Wisconsin
Kalmerton, Ed	Sheboygan Falls, R. 7,	Wisconsin
Kouz, Joe	Elkhart, R. 32	Wisconsin
Kuhn, Phil	Rockfield	Wisconsin
Kuhn, Geo. C.	Fredonia	Wisconsin
Kulhanek, Simon	Kewaunee	Wisconsin
Kuehl, W. M.	Kewaunee, P. O. Bx. 186,	Wisconsin
Koskamp, H. M.	Oostburg, R. 3	Wisconsin
Koopman, Albert	Port Washington	Wisconsin
Kalk, H. A.	Plymouth, R. 24	Wisconsin
Koepke, Otto	Kewaskum	Wisconsin
Knuth, Herman	Kiel, R. 3	Wisconsin
Kohli, Christ	Mayville, R. 3	Wisconsin
Kohli, Robt.	Knowles, R. 1	Wisconsin
Kasper, P. H.	Welcome	Wisconsin
Koenigs, Math	St. Cloud, R. 42	Wisconsin
Kuhn, J. J.	Cleveland, R. 1	Wisconsin
Kachel, T. A.	Whitewater	Wisconsin
Klessig, H. R.	Fredonia	Wisconsin
Kerscher, Frank	Manitowoc	Wisconsin
Kleinhesselink, G.	Cedar Grove	Wisconsin
Kornely, Chas.	Manitowoc, R. 7	Wisconsin
Kellert, Ed.	Grafton, R. 1	Wisconsin
Kiekhaefer, Aug.	Reedsville, R. 1	Wisconsin
Kachel, J. C.	Whitewater	Wisconsin
Kirkpatrick, John	Richland Center	Wisconsin

L

Lejeune, J. F.	Rice Lake, R. 2	Wisconsin
Lau, Lewis	Hartford, R. 4	Wisconsin

Luethy, H. B.	Reedsville	Wisconsin
Lorenz, A. C.	Manitowoc, R. 5	Wisconsin
Lutz, O. C.	Cleveland, R. 2	Wisconsin
Lisser, Alex.	Darlington	Wisconsin
Linzmeyer, J. B.	Angelica, R. 1	Wisconsin
Larson, H. C.	Dodgeville	Wisconsin
Luecke, W. F.	Manawa	Wisconsin
Leeseberg, Ralph	Milwaukee, 597 14th St.,	Wisconsin
Last, B. O.	Luxembourg	Wisconsin
Lord, Frank	Kewaskum, R. 5	Wisconsin
Lord, James	Ithaca	Wisconsin
Luethy, Adolph	Reedsville	Wisconsin
Loose, Henry	Hilbert, R. 4	Wisconsin
Luebke, A. C.	Forestville, R. 2	Wisconsin
Lammers, Arthur J.	Waldo	Wisconsin
Leavens, A.	Sheboygan Falls	Wisconsin
Lindow, Wm. C.	Plymouth, R. 27	Wisconsin
Larson, P. A.	Holeman	Wisconsin
Lounsbury, J. M.	Watertown	Wisconsin
Luchsinger, Thos.	Monroe	Wisconsin
Laabs, F. W.	Curtis	Wisconsin
LeFeber, John, Pres. Gridley Dairy Co.,	Milwaukee	Wisconsin

M

Lovell, R. C.	Juneau	Wisconsin
Malczenski, Edward	Pulaski	Wisconsin
Makazek, Paul	Kewaunee	Wisconsin
Moser, Joe	Brillion	Wisconsin
Meisner, Frank	Embarrass	Wisconsin
Miller, Henry	Peshtigo, R. 2	Wisconsin
Matin, H. F.	Osceola, R. 1	Wisconsin
Meusch, Arthur	Fond du Lac, R. 3	Wisconsin
McMillin, R. C.	Viroqua, R. 3, Box 57,	Wisconsin
Michels, Math	Madison	Wisconsin
Moore, Alex.	Pittsburg, 22 Sharon Ave.,	Penn.
Marks, F. F.	Colby, R. 1	Wisconsin
Moore, J. W.	Madison	Wisconsin
Marty, Gottlieb	Madison	Wisconsin
McCready, J. B.	Sheboygan	Wisconsin
Mahlik, M. J.	Pilsen	Wisconsin
Mayer, Henry	Darlington	Wisconsin
Marty, Fred	Monroe	Wisconsin

Moore, J. G.	Madison	Wisconsin
Mayhew, A. B.	Clintonville	Wisconsin
Mayhew, E. B.	Greenbush	Wisconsin
Mayer, Math	New Holstein, R. 3	Wisconsin
McCarthy, J. T.	West Concord	Minnesota
Matznick, G. M.	Kiel, R. 1	Wisconsin
Maas, Emil	Oostburg, R. 13	Wisconsin
McAdams, Will	Waukesha	Wisconsin
McManners, H.	Madison	Wisconsin
McNicholas, Frank	Plymouth, R. 26	Wisconsin
Muehleisen, Gottlieb	Tell	Wisconsin
Manning, Tim	Richland Ctr., R. 2	Wisconsin
Muehlberg, O. E.	Fredonia	Wisconsin
Maechtle, A. G.	Port Washington	Wisconsin
Matthews, Vern	Excelsior	Wisconsin
Mrotek, Peter	Kewaunee	Wisconsin
McCaig, J. H.	Watertown	Wisconsin
Maurer, W. H.	Rock Grove	Illinois
McGill, James	Little Suamico	Wisconsin
Meyer, Reinhold Mfg. Co.	Plymouth	Wisconsin
Moldenhauer, H. R.	Watertown	Wisconsin
McCormick, Chas.	Dodgeville, R. 2	Wisconsin
Marschall, Chas.	Lomira, R. 1	Wisconsin
Meyer, M. H.	Madison (Dairy School),	Wisconsin
Marschall, A. J.	Madison	Wisconsin
Murphy, Morris	Chicago, 229 So. Water St.	Ill.
Murray, R. A.	Richland Center	Wisconsin

N

Newman, Henry	Sawyer, R. 6	Wisconsin
Noyes, H. J.	Muscoda	Wisconsin
Newell, J. A.	Merrill, R. 5	Wisconsin
Noyes, H. L.	Muscoda	Wisconsin
Nussbaumer, F. W.	Sheboygan Falls, R. 9	Wisconsin
Newman, B. W.	Madison	Wisconsin
Natzke, Dan	Wayside, R. 1	Wisconsin

O

Olson, Theodore	White Mound	Wisconsin
Ostrander, J. M.	Mineral Point	Wisconsin
Okonski, Paul	Kewaunee	Wisconsin

P

Peters, Paul	New London	Wisconsin
Polechek, Frank	Brussels, R. 2	Wisconsin
Patt, C. H.	Van Dyne	Wisconsin
Peterson, Peter M.	Clyde	Wisconsin
Pringle, E. C.	Elkhart Lake, R. 32	Wisconsin
Possley, N. E.	New Holstein, R. 3	Wisconsin
Priebe, H. W.	Kewaunee, R. 6	Wisconsin
Parkins, A. W.	Cannon Falls	Minnesota
Peters, John H.	Sheboygan Falls, R. 9	Wisconsin
Princel, H.	Mishicot	Wisconsin
Paasch, Wm.	Cedar Grove, R. 14	Wisconsin
Pelke, Louis	Welcome	Wisconsin
Peacock, P. H.	Sheboygan	Wisconsin
Peirick, J. J.	Beaver Dam	Wisconsin
Pipal, V. W.	Blue River	Wisconsin
Parkhurst, S. D.	Chicago, Rector Bldg.	Illinois
Plansky, Frank A.	Kewaunee R. 3	Wisconsin
Petznick, Robt.	Waldo, R. 22	Wisconsin
Peterson A. F.	Appleton, R. 3	Wisconsin
Petri, John	Wayne, Campbellsport,	Wisconsin
Pool & Lou	Darlington	Wisconsin

Q

Quinn, W. P.	Seattle	Washington

R

Rothenbach, J., Jr.	Ackerville	Wisconsin
Ropella, Lara	Amherst Jct.	Wisconsin
Radke, R. H.	Marion	Wisconsin
Rank, J. P.	Luxembourg	Wisconsin
Radloff, Max P. E.	Hutisford	Wisconsin
Roethlesberger, John	Juda, R. F. D.	Wisconsin
Rice, John	St. Cloud	Wisconsin
Reiser, Mick	New Holstein, R. 3	Wisconsin
Rusch, A. J.	Thorpe	Wisconsin
Reineking, F. C.	Plymouth, R. 29	Wisconsin
Richert, G. W.	Pelka	Wisconsin
Roegner, Arthur	Chilton, R. 5	Wisconsin

Regez, Ernest, Jr.	Blanchardville	Wisconsin
Regez, Ernest, Sr.	Blanchardville	Wisconsin
Rothenbach, J.	Ackerville	Wisconsin
Rassmussen, Chas	Clintonville	Wisconsin
Rendler, G. L.	Coon Valley, R. 1	Wisconsin
Radder, Wm.	Reedsville, R. 1	Wisconsin
Reid, John	Oconomowoc	Wisconsin
Ropp, N. L.	Wrightstown	Wisconsin
Roth, O.	Monroe	Wisconsin
Rolfe, J. H.	Chicago, Randolph & Clinton Sts.	
Ruppel, J. F.	Reedsville, R. 3	Wisconsin
Ryf, John	Oshkosh, R. 6	Wisconsin

S

Strausburg, Chas	Loyd	Wisconsin
Spetch, John	Oshkosh	Wisconsin
Schneider, L. A.	Algoma, R. 1	Wisconsin
Steger, A. J.	Theresa	Wisconsin
Schmelzer, A. J.	Avoca,	Wisconsin
Schneider, Christ	So. Germantown	Wisconsin
Schweitzer, P. A.	Allenton	Wisconsin
Scott, H. M.	Waldo	Wisconsin
Schoepfer, Herman	Hollandale	Wisconsin
Swits, G. H.	Milwaukee, Ft. 12th St.,	Wisconsin
Schenkel, Fred	Calamine	Wisconsin
Schurman, F. J.	Belmont	Wisconsin
Shumway, C. P.	Milwaukee, 412—14 Rx. Bldg.	Wis.
Skinner, David P.	Milwaukee, 412-414 Ry. Ex.,	Wis.
Southard, Roy	Cadott	Wisconsin
Schauf, Albert	Neptune	Wisconsin
Sherwood, A.	Milwaukee, Ft. of 12th St.,	Wis.
Schrweide, Wm.	Chilton	Wisconsin
Schrweide, Aug.	Hilbert, R. 4	Wisconsin
Swenink, Fred	Cazenovia, R. 1	Wisconsin
Schaeffer, Ed. F.	Muscoda	Wisconsin
Scholl, Wm.	Spring Green, R. 1	Wisconsin
Sonabend, Theo.	Collins	Wisconsin
Schroeder, Herman	Greenleaf, R. 3	Wisconsin
Simmons, D. S.	Viola	Wisconsin
Sixel, H.	Cleveland, R. 1	Wisconsin
Schulte, Alex.	Hilbert, R. 3	Wisconsin
Senn, Jake	Belleville	Wisconsin

Steinhart, G. J.	Kewaunee	Wisconsin
Sommer, Otto	Cedarburg	Wisconsin
Schwingle, E. G.	Avoca	Wisconsin
Stocker, J. J.	Dale, R. 18, Box 2,	Wisconsin
Schaller, Alex.	Barneveld	Wisconsin
Schaller, Rudolph	Barneveld	Wisconsin
Sobek, Chas.	Muscoda, R. 1	Wisconsin
Sanger, F. C.	Lark	Wisconsin
Schmitt, W. F.	Blue River	Wisconsin
Sawyer, L. H.	Neptune	Wisconsin
Schneider, Henry	Marbel	Wisconsin
Schultz, H. S.	Cato	Wisconsin
Schurter, Jacob	Argyle, R. 4	Wisconsin
Schuepke, W. J.	Welcome, R. 40	Wisconsin
Sweeting, C. W.	Manitowoc	Wisconsin
Sudendorf, E.	Clinton	Illinois
Schaefer, J.	Marshfield	Wisconsin
Schujahn, F. O.	Fond du Lac	Wisconsin
Stoltz, Henry J.	Milwaukee (G. N. R.)	Wisconsin

T

Taplin, L. P.	Calvary, R. 41	Wisconsin
Thor, Joe J.	Kewaunee, R. 4	Wisconsin
Teske, A. W.	Kewaunee, R. 7	Wisconsin
Thomas, W. C.	Sheboygan Falls	Wisconsin
Trudelle, S. F.	Chicago, 87 Michigan St.,	Illinois
Theisen, Jacob	Belgium	Wisconsin

U

Ulrech, Furrer	Hollandale	Wisconsin
Ubbelohde, Fred	Glenbeulah	Wisconsin
Urfer, Louis	Monroe	Wisconsin

V

Vogt, John	Fremont, R. 17	Wisconsin
Vogt, Gessie	Fremont, R. 17	Wisconsin
Vogel, Gottfried	Mt. Horeb	Wisconsin
Vogel, Emil	Mt Horeb	Wisconsin
Van Duser, J. E.	Fort Atkinson, R. 2	Wisconsin

Voeks, Robert	Fredonia	Wisconsin
Viergutz, F. A.	Appleton, R. 5	Wisconsin
Van Blarcom, C. C.	Fond du Lac, 184 E. 1st St.,	Wis.

W

Wirkus, J. K.	Edgar	Wisconsin
Wallace, Pat	Hortonville, R. F. D. 21,	Wisconsin
Walls, Chas. G.	Rockbridge	Wisconsin
Waddell, Wm.	Hub City	Wisconsin
Wordell, H. E.	Brillion	Wisconsin
Westphal, Aug.	Neosho	Wisconsin
Winkler, John	Merton	Wisconsin
Waterstreet, Wm.	Spring Green	Wisconsin
Willard, J. C.	Plymouth	Wisconsin
Winder, Wm.	Rockbridge	Wisconsin
Weyer, Otto	Manitowoc	Wisconsin
Westphal, F. C.	Fall River	Wisconsin
Wehenger, John	Woodford, R. 2	Wisconsin
Williams, C. H.	Chicago, 306—21 Quincy St.	Ill.
Ward, Joe	Sandusky	Wisconsin
Werth A. C.	Neenah	Wisconsin
Weber, Albert	Allenton	Wisconsin
Wellinghoff, E. F.	Chicago, 182 Kinzie St.,	Illinois
Webster, Edgar	Clyde, R. 1	Wisconsin
Wendland, Herman	Sheboygan, 1534 So. 11th St.,	Wis.

Y

Young, John	Spring Green	Wisconsin

Z

Zutz, C. H.	Reedsville	Wisconsin
Zimmerman, Bruno	Schlessingerville	Wisconsin
Zehren, J. L.	Marion	Wisconsin
Zumkehr Peter	Monroe	Wisconsin
Zickert, Ed.	Watertown, R. 6	Wisconsin
Zwieky, Tied	Allensville	Wisconsin

TRANSACTIONS

WITH

ACCOMPANYING PAPERS AND DISCUSSIONS

OF THE

Wisconsin Cheese Makers' Association

Sixteenth Annual Meeting, 1908.

The Wisconsin Cheese Makers' Association met in its sixteenth annual session at Freie Gemeinde Hall, Milwaukee, and was called to order at 10 o' clock A. M., Wednesday, January 8, 1908, by the president, Mr. Matthew Michels.

INVOCATION.

J. G. MOORE, Madison, Wis.

Our Father in Heaven, we come to Thee with thankful hearts and know and feel that Thou hast cared for us and kept us from danger.

We come together again, Oh Lord, in this convention so we we may fit ourselves more properly for the work to which Thou hast called us. We appear before Thee as workmen who need not be ashamed. We ask for Thy blessing that we may go forth from here better men, fitted to do better work. We ask that these meetings may be carried on in a spirit that will be best for us.

We ask Thy blessings, Oh Lord, not for any merit that may be in us but for the sake of Him who died for us, our Father, Jesus Christ. Amen.

The President: The next topic will be the address of welcome by the Honorable Sherburn M. Becker, the well known mayor of the city of Milwaukee. I have the pleasure of introducing to you at this time Mayor Becker.

ADDRESS OF WELCOME.

HONORABLE SHERBURN M. BECKER, MILWAUKEE, WIS.

Mayor, City of Milwaukee.

Mr. President, Ladies and Gentlemen:

In full appreciation of the importance of your work, your achievements and purposes, I most cordially welcome the Wisconsin Cheese Makers' Association to Milwaukee for its sixteenth annual meeting. In no formal or perfunctory greeting, but with open hands and a warmth of friendship not to be misunderstood, Milwaukee seeks to co-operate with you in every effort of advantage and benefit to your association and to all kindred organizations.

Miwaukee, permit me to say, is but a splendid reflex of Wisconsin. Its massed industry and commerce, its prosperity and stability, its progress and thrift are but a reflecting picture of general conditions. There is everywhere, throughout Wisconsin, the same keen inspiration seeking the up-building of a magnificent commonwealth, the same broad, public spirit giving high scope and character to our endeavors. Milwaukee's thrift and stability is the thrift and stability of Wisconsin segregated. The progress of the state is here reflected in the magnificent industries and enterprises to which the farms and forests, the mines and abounding resources of Wisconsin contribute. The products of our factories, mills and workshops, sent broadcast throughout the world, do not alone picture Milwaukee's greatness as a commercial and industrial center. They speak in terms not to be misunderstood, of Wisconsin's wealth of resource, of its golden values in dairy products, and of all else wherein men and women excel in meeting the competition of their fellows.

It is in no narrow spirit of local pride that Milwaukee extends its hearty greetings to your association upon this occasion. It is in full recognition of the fact of our relationship to, and dependence upon, the state at large, that impels the co-operation of Milwaukee in every activity seeking the betterment of conditions in Wisconsin. The growth of the city, through the enlargements of its industries and added population, means a better market for the food producers of Wisconsin. The growth of the state means added sales to benefit Milwaukee merchants and manufacturers. Our relationship is mutual in advantages and it is pleasure to note, that Wisconsin can act no better towards Milwaukee than to make it the annual meeting place of associations of this important character. It is Wisconsin's one big city, hospitable, generous and sociable to all comers. We want the people of Wisconsin to know Milwaukee, its progressiveness and splendid citizenship.

I know of no better illustration to show the progress of Wisconsin than is afforded by the splendid work of this association. I believe that the great cheese producing industry of Wisconsin, one of greatest revenue producing importance to the farmers of this state, in its business success, can be ascribed to the intellegent as well as organized effort put forth to guarantee the purity of Wisconsin cheese as well as other dairy products. We have but to recall the status of this industry, before the cheese makers, organized and by their efforts, gave notice to the world that the Wisconsin product, in purity and quality, could seldom be excelled. With the undoubted and proven excellence of Wisconsin climatic conditions as applied to the production of cheese, with nutritious grasses and a vast pasturage abounding in pure water springs and streams and every natural condition favorable, the pirates against honest production put their brand of shame upon the Wisconsin cow.

I know that the honest dairyman of Wisconsin will look back to that period with sorrowful regret, and as they recall the time when the label, "Wisconsin Full Cream Cheese," was more often but the concealment of fraud, will feel like apologizing to their herds. The Wisconsin cow, while then possibly not up to its present standard grade or pure blood, was nevertheless honest in the share of work allotted to her. The milk was as nature supplied it, until it reached the skimming vats, with no application of the Babcock test, to disclose how often the butter fat had been depleted, or how often the product of the pump, and not the cow, had been added.

The product was dishonest, a fraud upon purity and a shame to the state, costing the dairymen of Wisconsin millions in lost sales, until the dishonesty and misrepresentation could be stopped. A few pioneers, such men as Hoard, Cook, Adams, Henry, Emery, well known to all of you here assembled, started a movement for the rehabilitation of the Wisconsin cow and her products The honesty of Wisconsin citizenship arose in response to the agitation, as it always does. The growth of the dairy legislation and its proper enforcement, in this state has been the result. but back of all that, to me, is the far more significant fact, that the men who are engaged in manufacturing the cheese and butter of the state, and the farmers who own the herds, with an occasional exception it is true, are inspired by that progressive spirit which makes for the welfare of Wisconsin in no stinted degree.

That this relative perfection has largely been brought about through the efforts of this association, each member working as an educator in his own local field, must be admitted. The membership of the association and the leadership of the entire dairy movement in Wisconsin has been honest and today's magnificent proportions of this industry, in money returns to the state, is to my mind, an example ringing true of that high quality of citizenship so characteristic of Wisconsin. There were frauds and law breakers among you, but you drove them out, until today, the rubber stamped label affixed to a box of Wisconsin cheese, is a certificate of honesty the world over.

This has been the spirit of your association and of other state organizations of various intents and purposes. It is a Wisconsin spirit, distinctive and characteristic of high grade men and women who achieve, who do things worth doing, who are not supinely content to accept what is, but who aspire to the attainment of what should be. The process may sometimes be impeded with uncertainty, and the results slow in being attained, but we have a way of "getting there" in the results.

The Virginian, who through the accident of geography, happens to have his birth across the border-line into another state, regrets the incident as in his spirit of state pride, he apologizes for not being a "Born Virginian." The Kentuckian never fails to declaim about the blue grass sweeps and verdant mountains of his state, while we in Wisconsin, blessed with the bounty of God's prodigality in resources, with an amalgamation of racial strength and the power and determination of men who always conquer, at times I fear, forget that spirit of state pride to which we are justly entitled by the excellence of our heritage. I want to quicken this spirit of a better appreciation as applied to Wisconsin. Look at the picture of what we have, in all that makes for the welfare of our citizenship, and see if it does not lead to a keener pride in being of a commonwealth unequalled in present accomplishments and in the broader possibilities of future achievements conducive of betterment.

I earnestly hope that next year you will hold your convention in Milwaukee, and at this time I want to extend an invitation to you to come to the City Hall. I should be very happy to show each and every one of you through that magnificent building, which is one of the finest municipal buildings in the United States, and if there is anything concerning the working of our municipality in which you are interested, I shall be only too happy to discuss any subject concerning this administration or the government of Milwaukee with you. I thank you.

The President: The response to this very cordial address of welcome will be given by Mr. H. C. Larson, of Dodgeville, Wis.

RESPONSE TO ADDRESS OF WELCOME.

MR. H. C. LARSON, DODGEVILLE, WIS.
Assistant Dairy and Food Commissioner.

Mr. President, Honorable Mayor Becker, Ladies and Gentlemen, and Members of the largest State Cheese Makers' Association in the World.

I don't know why Secretary Baer invited me to respond to this address of welcome, when there are so many others better fitted to do so. However, I feel proud of the privilege of thus serving an organizaton that has done so much in the direction of building up the cheese industry in this state.

It is, indeed, gentlemen, an honor for us to be so cordially welcomed to this the greatest business city of the state by its mayor, and, Mr. Mayor, in behalf of this association I want to thank you for it. I assure you we enjoy coming to your most beautiful city for our annual convention, because we have met here so often and been treated so well.

When we consider the cheese industry which we represent, the progress it has made within the last few years and the leading position that our cheese holds in the different markets of the world, we have reason to feel proud of it, and we are proud. There are in Wisconsin nearly seventeen hundred cheese factories, with about thirty-five thousand patrons who milk nearly four hundred thousand cows, contributing 1,500,000,000 lbs, of milk annually, which when manufactured into cheese of different kinds is worth about $12,000,000. These factories are scattered over the state in fifty seven counties, with from one to two hundred factories in a county. Think of the vast amount of money invested in the cheese business and the thousands benefited by it, also the good influence it has upon the retail and wholesale business of this state. In the main, the cheese makers employed in these various cheese factories throughout the state are men who know their business, do their work better, keep their factories cleaner and in a more sanitary condition than ever before in the history of the cheese business. The farmers are more intelligent, know how to do more profitable dairying, their cows are of better dairy type, better housed and fed than ever before, the milk receives more care and is delivered to the factories in better condition, consequently we have a better finished product and more money and profit in the business.

I am pleased to look into the faces of so many cheese makers. If there is anything that would please me better it would be more cheese makers. I would that all the cheese makers in the state could have been here and heard the warm address of welcome to which we have just listened. Coming, as it did, from a man of the honorable mayor's standing and position, it seems to me that it should be a source of stimulation to us to know that the business in which we are engaged has the good will of such men, so much so that no matter what our records are we should set out to improve them.

We are proud of this city, Mr. Mayor, and glad we are privileged to hold our sixteenth annual meeting here, we are glad to be welcomed and given a hearing for the industry in which we are so greatly interested.

PRESIDENT'S ADDRESS.

Matthew Michels, Madison, Wisconsin.

Ladies and Gentlemen and Members of this Association:

Assembled in this our Sixteenth Annual Convention, it gives me great pleasure indeed to see so many of the old as well as the new faces in this audience. Our meetings in past years have always been very successful from every point of view, a fact, which is very gratifying to all cheese makers, having the welfare of the cheese making industry at heart.

We are here today for the eighth time enjoying the hospitality of this beautiful city of Milwaukee, we have been accorded, as usual, a most hearty welcome and there is no question but what our stay while here will be such that those who invited us will feel proud of the fact that their invitation was again accepted. The prospects for the success of this meeting are looming up even brighter than at any previous one.

The purpose of this association as stated in our Articles of Incorporation shall be the education of its members for a better practical knowledge of cheese factory operation, promoting progress in the art of cheese making, the sale, transportation and storage of cheese, and in the weeding out of incompetency in the business of cheese making.

This Association, the Dairy School and the Dairy and Food Commission are doing a great work in educating the cheese maker to a better practical knowledge of cheese factory operation. The forming of county or district associations and the meeting of cheese makers about once a month would be a step in the right direction. Such questions as uniformity, sale and cow testing as well as many others could be taken up and much good accomplished.

The Wisconsin Dairymen's Association is doing an untold amount of good work in organizing cow testing associations in many parts of our State. I want to urge every cheese maker to secure, if possible, a man from the Dairymen's Association to help him organize such an association among his patrons. In Denmark one half of the dairymen are testing their cows and in many parts of our State, mostly through thte efforts of the Dairymen's Association, the testing of cows has been started in the past year. I believe the cheese maker should take an active interest in this matter. He should persuade his patrons to test their herds in order that they may know at the end of the year, the exact production of the individual cow. The testing of cows will not only result in getting more and better milk, but will eventually give the patron a larger net profit per cow and encourage him to produce milk during the entire year.

I would like to give a few facts regarding the Wisconsin Dairy School Exhibitions, which were opened last May. Up to the present time we have scored seven hundred fifty-nine (759) exhibits of cheese and nine hundred ninety-two (992) of butter or a total of one thousand seven hundred fifty-one (1,751) samples. All of these exhibits received a commercial score by each of the three judges and a moisture determinaion was made of every exhibit. There is an enormous amount of work connected with these scorings, all of which is given free to the manufacturers of cheese and butter taking part in them.

The Dairy and Food Commissioner furnishes two men each month to help in judging, Mr. Cannon on cheese and Mr. Corneliuson on butter. The U. S. Government through the kindness of Chief Webster gave us one of their men, Mr. Moore, as another judge. The other judges, as well as all the expenses connected with the scorings are paid by the Wisconsin Dairy School.

The cheese and butter has all been sold at very satisfactory prices, the proceeds of such sales being remitted to the exhibitors. Often cheese and butter makers get into trouble with their product, sjmply because the quality has gone off so gradually that they have failed to notice the change, thereby perhaps losing hundreds of dollars a year, either in direct reductions or indirectly by constantly underselling.

Many states are now carrying on so called "Scoring Contest." While the educational features may be the same, in most of these contests there will be a highest average score of all, which will be given nearly all the glory and honor there is to be had. Many others that may come within a fraction of a point to the very highest are not in sight. They are not given the credit actually due them.

The Wsiconsin Exhibitions are in no sense a "contest" but designed purely to assist the maker in his efforts to improve his products and to maintain a high standard of quality in them. At the end of twelve months if we have fifty or more that reach the high mark set to obtain an "A" diploma, each will be given such. To all exhibitors having participated in these scorings for twelve months within a period of two years are issued diplomas according to their standings. These diplomas will have an artistically designed cut of the Dairy School building and a picture of the person to whom the diploma is granted. The aim of every exhibitor taking part in these exhibitions should be to land an "A" diploma, if he fails the first year, he should continue until he does succeed. To hold a diploma in class A will mean as much to the winner as a college diploma means to men engaged in other professions.

The past year has been the most prosperous one in the history of cheesemaking. I hope when you take leave of this convention and beautiful city, that you will feel it has been good for you to be here.

I would recommend that this Association continue to carry out the plan of increasing the premium fund by setting aside a certain amount of each exhibit to be added to the pro-rata premium fund offered the following year. Also that it hold a free for all Judges' Scoring Contest. In such contest fifty per cent of the points should depend upon the contestant's own score in duplicate and fifty per cent on how near he can get to the score previously given.

There is no doubt that if the members of this Association act collectively, they will always be a great force in the advancement of the cheese making and dairy interests of our State.

I feel as though I would be unworthy of your confidence to let this occasion go by if I did not thank you for the honor conferred on me by electing me your presiding officer without a dissenting vote.

In conclusion I want to suggest to you the advisability of being prompt in attending each session. Our secretary has given us a very full, practical and instructive program and it is only justice to him that we show our appreciation of his efforts in this manner.

The President: We will now listen to the report of the Secretary, Mr. U. S. Baer.

REPORT OF SECRETARY.

U. S. Baer, Madison, Wisconsin.

Mr. President and Members of the Association: I have the honor to report upon the work of this office for the year ending January 8th, 1908.

The future outlook for the general success of the organization was never as encouraging as at the present time. The membership for the past year has again increased nearly one-fifth over that of the preceding year.

The cheese product of our state today is superior to that made in any former period in the history of the industry. Cheese making is rapidily becoming the specialty of districts of wide area in northern Wisconsin. It is now regarded as among the most progressive and highly developed forms of farming in the state. Co-operative and commercial organizations are being formed to conduct the business locally and to guard its general interests. State laws are being rapidly enforced by the Dairy and Food Commission, which have been the means of very materially fostering this industry during the history of the Department under Hon. J. Q. Emery's wise and energetic supervision.

We may safely congratulate ourselves on the fact that of all the several diversified interests of agriculture none have prospered or afforded the people of the state more substantial returns than the cheese business the past season.

The copy for the annual report was ready for the printer early in March, but the Department of State refused to accept it until late in July, because of the great amount of printing up to that time in the hands of the state printers. At the time of acceptance I fully expected that it would receive immediate attention and be published at an early date. After the copy had been in type for some time, I was further informed that the publication was again delayed, owing to some difficulty in the matter of contracts between the State and certain manufacturers of paper or materials necessary to the completion of the report. Three thousand copies of the four thousand edition of the report were sent out promptly after being received about December 10th.

Our treasurer's financial statement will show the sources from which all moneys paid into the treasurer's hands were received, and the disbursements paid on orders received from this office, which he holds as vouchers, for the year beginning January 8th, 1907, and ending January 8th, 1908.

We are looking forward to the time when there may be a great National dairy show held in this city, which will be possible on the completion of the proposed mammoth new auditorium to cost $500,000.00 and which it is reported will be ready a year hence. In the effort to secure that great show we will need the cooperation of the various Wisconsin associations devoted to the dairy interests. No state in the Union can prepare for a greater exhibit of this kind than our own Wisconsin. Let it be the watch-word "*Monster Dairy Show for Milwaukee 1909.*" Milwaukee should take a hand in spreading the fame of the state's dairy products by assisting in arranging for such a show. It should be held in the winter as cold weather is the best time for holding a dairy show and it should be held in Milwaukee. To the visitors the Cream City is at her best at that time of the year. Milwaukee by enlisting the aid of the dairy interests of the state could arrange for a great dairy show that would be of incalculable good to the dairy interests and would be most helpful to the city and to the state.

On January 11th, 1907, this organization unanimously adopted the following resolution:

"WHEREAS, the Wisconsin Butter Makers' Association has, since its organization six years ago adopted the plan of having the butter makers competing for the premium fund, donate their tub of butter which is sold, and after deducting one dollar for the membership fee, which goes into the general fund, and the express and other charges attending the exhibit the balance is used as a premium for the next convention, and we are reliably informed that this premium fund aggregates over $1,000 each year, and whereas, the larger the premium fund the greater interest, *Therefore, be it resolved,* that we agree to allow a certain proportion to be taken from the sale of our exhibits to be used for such premium fund."

It is true that the Wisconsin Butter Makers' Association when it first met had a very small premium fund, and the butter makers who sent butter to that first convention donated their tub of butter. As I remember it there were 110 butter makers who entered and contributed a tub of butter. A tub of butter will cost a butter maker somewhere between five and six dollars. Of course there may be an objection in the minds of some of you on account of the size of cheese. A Swiss cheese maker, for instance, with his two or three hundred pounds of cheese would hardly be expected to donate the value of that cheese as compared with the exhibitor of Young Americas equivalent to twenty pounds, but a certain number of pounds could be sent and the Swiss cheese or a large cheese sold, and the price for a certain numbr of pounds donated. After the first year it will not be so bad as it looks. Last year the Wisconsin Butter Makers' Association had $1,139.42 in its premium fund, and this year I understand, the amount is nearly if not quite so large; $539.00 of that being money the butter makers contributed themselves last year from the sale of their butter. The entire amount was $928.85, but expenses attending judging, express charges, membership fees, etc. cut it down to $576.10. I can see nothing that will so add to the interest and bring out a larger number of exhibits than this one particular thing of making a larger premium fund.

The Minnesota State Butter and Cheese Makers' Association at its convention last year gave over $1,200.00 in premiums to the exhibitors for butter and cheese. Not one dollar of this money had to be solicited from any supply house or otherwise. The entire amount being realized from the butter and cheese exhibits—principally butter—from the year before. A premium fund secured under such conditions can be enjoyed with a much greater feeling of independence than when solicited from unwilling contributors.

Respectfully submitted,

U. S. Baer.

The President: Next is the report of Mr. F. E. Carswell, our treasurer.

TREASURER'S FINANCIAL REPORT FOR 1907.

F. E. CARSWELL, Richland Center, Wis.

Mr. President and Members of the Association: The following itemized report is made, showing the sources from which all moneys paid into the treasurer's hands were received and the disbursements paid on orders from the secretary, which I hold as vouchers:

Receipts.

1907.		
Jan. 3.	Balance carried forward	$90 07
Jan. 11.	Paid memberships	427 00
Jan. 17.	Refund, Western Passenger Association	17 00
Jan. 17.	Paid memberships	2 00
Jan. 22.	Paid memberships	2 00
Feb. 16.	Paid memberships	2 00
July 6.	Draft from State Treasurer............	600 00
July 9.	Paid membership	1 00
Dec. 31.	Wisconsin Dairy Supply Co...........	15 00
Dec. 31.	J. B. Ford Co.........................	20 00
Dec. 31.	A. C. Parfrey.........................	10 00
Dec. 31.	John Kirkpatrick	5 00
Dec. 31.	Wisconsin Dairy Farms Co............	5 00
Dec. 31.	Wm. J. Moxley & Co.	5 00
Dec. 31.	Kiel Wooden Ware Co.	10 00
Dec. 31.	J. Hanson & Co.	10 00
Dec. 31.	International Salt Co.	10 00
Dec. 31.	Elov Ericsson	5 00
Dec. 31.	Marschall Dairy Laboratory...........	10 00
Dec. 31.	Creamery Package Mfg. Co...........	25 00
Dec. 31.	The De Laval Separator Co............	10 00
Dec. 31.	New York Produce Review & American Creamery	5 00
Dec. 31.	Waverly Oil Works	5 00

Dec. 31.	C. E. Udell & Co	10 00
Dec. 31.	Grunert Cheese Co	5 00
Dec. 31.	Chr. Hansen's Laboratory	10 00
Dec. 31.	Frank L. Jones	10 00
Dec. 31.	E. A. Roser & Co	10 00
Dec. 31.	Albrecht Bros. & Co.	10 00
Dec. 31.	Brillion Iron Works	5 00
Dec. 31.	International Harvester Co., of America	10 00
Dec. 31.	Wallace B. Crumb	5 00
Dec. 31.	Plymouth Cheese Co.	5 00
Dec. 31.	Standard Oil Co.	10 00
Dec. 31.	S. J. Stevens Co.	10 00
Dec. 31.	Wisconsin Coal Co.	10 00
Dec. 31.	Republican Hotel	10 00
Dec. 31.	A. Booth & Co.	10 00
Dec. 31.	Dairy Employment Agency	5 00
Dec. 31.	W. C. Thomas	5 00
Dec. 31.	Northwestern Cheese & Butter Insurance Co	5 00
Dec. 31.	Diamond Crystal Salt Co.	5 00
Dec. 31.	Cornish, Curtis & Greene Mfg. Co.	10 00
Dec. 31.	P. H. Peacock	5 00
Dec. 31.	A. H. Barber Cry. Supply Co.	10 00
Dec. 31.	Crosby & Meyers	10 00
Dec. 31.	Colonial Salt Co.	10 00
Dec. 31.	J. B. Lewis Co.	10 00
Dec. 31.	John Habhegger	5 00
Dec. 31.	D. & F. Kusel Co.	10 00
Dec. 31.	Otto Biefeld & Co.	10 00
Dec. 31.	Dornfeld-Kunert Co.	10 00
Dec. 31.	M. Fitzgerald	10 00
1908.		
Jan. 6.	Hon. S. A. Cook	25 00
		$1,566 07

Disbursements.

1907.		
Jan. 9.	Pro rata premium fund	$ 100 00
Jan. 10.	Expenses of office of secretary	150 00
Jan. 11.	Mrs. M. G. Carpenter, stenographic services	50 00

Jan. 14.	Republican Hotel, hotel bill	143 70
Jan. 14.	Entertainment, music	10 00
Jan. 14.	Flowers, express, cartage	11 30
Jan. 14.	Postage	10 00
Jan. 15.	Milwaukee Sign Co., 8 signs	12 50
Jan. 15.	Salary voted J. W. Cross by Board of Directors	20 00
Jan. 31.	Mayers Electric Press, printing	131 50
Jan. 31.	The Schwaab Stamp and Seal Co.	72 00
Jan. 31.	F. A. Averbeck, 12 medals	52 00
Jan. 31.	Robert Johnston, traveling expenses	31 00
Jan. 31.	Ernest Regez, Jr., cheese	9 09
Jan. 31.	Interest on borrowed funds, State bank	24 20
Jan. 31.	Henry Ellmer, damaged Swiss cheese at N. D. Show	20 00
Jan. 31.	Postage checks, express, exchange, freight	6 45
Jan. 31.	Albert Strueben, traveling expenses	7 00
Jan. 31.	Express	1 75
Feb. 10.	Postage	5 00
Mar. 5.	Louis Alder, traveling expenses	8 85
Mar. 5.	Miss Alma Roump, stenographic services	5 20
Mar. 5.	Hon. H. R. Wright, expenses attending annual meeting	30 90
Apr. 9.	Miss Alma Roump, stenographic services	2 75
Apr. 9.	Prof. E. G. Hastings, expenses attending annual meeting	4 50
Apr. 9.	Prof. E. H. Farrington, expenses attending annual meeting	7 79
Apr. 9.	Mrs. Mary Carpenter, stenographic services	30 35
Apr. 22.	Walter Mayer, printing	13 75
Apr. 22.	Sorenson & Son, premium chair	13 00
Apr. 22.	Wisconsin Cheese Scoring Contest Association	43 87
Apr. 22.	A. J. Glover, expenses attending annual meeting	5 33
May. 30.	Premium deposit, Muscoda Dairy Board	15 00
May 30.	G. C. Hindy, expenses attending annual meeting	15 00
May 30.	J. W. Cross, Supt. cheese exhibit	19 09

May 30.	D. S. Crosby, expenses cheese judging..	19	95
May 30.	Peter Zumkehr, expenses attending annual meeting	7	75
May 30.	Gottfried Marty, expenses attending annual meeting	6	50
Aug. 10.	Postage	5	92
Sept. 2.	Postage	7	50
Nov. 2.	Miss Alma B. Roump, stenographic services	2	50
Nov. 2.	Postage	8	00
Nov. 7.	Hammersmith Engraving Co., 3 half tones	22	12
Nov. 12.	Postage	7	00
Nov. 18.	Postage	10	50
Dec. 1.	Postage	5	00
Dec. 16.	Postage	7	00
Dec. 20.	Postage, mailing annual report	52	00
Dec. 23.	J. W. Cross, expenses attending executive meeting	7	66
Dec. 24.	Postage, express, freight, telephone....	4	94
Dec. 26.	Postage, reports, entry blanks, drayage, packages	16	80
Dec. 26.	Postage, 900 programs @ 3c each......	27	00
Dec. 30.	Postage, reports, letters, packages, express, telegrams	22	18
1908.			
Jan. 7.	Printing, stationery, postage, telephone, Fred Marty	5	50
Jan. 7.	Interest on borrowed funds.............	8	20
Jan. 7.	Postage, reports, programs, letters, entry blanks, packages	17	00
	Total Disbursements	$1,353	39
	Balance in hands of Treasurer.......	212	68
		$1,566	07

On motions, duly seconded, the reports of the secretary and treasurer were adopted as read.

The President: We will now listen to the report of the Board of Directors.

REPORT OF BOARD OF DIRECTORS.

JOHN GROOTMONT, Brillion, Wis.

Gentlemen: A meeting of the directors and officers of the Wisconsin Cheese Makers' Association was held at the State Fair Park on the twelfth day of September, 1907.

Present: Mat. Michels, president; F. E. Carswell, treasurer; U. S. Baer, secretary; Jake Karlen, director; J. W. Cross, director; John Grootemont, director.

Upon the motion of Mr. Grootemont, seconded by Mr. Cross, the secretary was instructed to announce the sixteenth annual meeting of the Wisconsin Cheese Makers' Association for the 8th, 9th and 10th days of January, 1908.

Upon the motion of Mr. Carswell, seconded by Mr. Karlen, it was unanimously voted that the sixteenth annual meeting of the Wisconsin Cheese Makers' Association be held in the city of Milwaukee.

The president appointed director John Grootemont and secretary U. S. Baer as committee on entertainment. Said committee being instructed to make complete and final arrangements with reference to convention halls, exhibition rooms and hotel headquarters in the city of Milwaukee.

The secretary was instructed to arrange dates of the time of the entries of cheese so as to have the entire exhibit judged prior to the opening day of the convention.

By order of the board of directors the rules of governing the cheese exhibit were left changed as per rules of 1907 so as to admit of the entry of all the cheese of the ninth monthly "Cheese Scoring Exhibition" in connection with the regular educational cheese scoring contest exhibit of the Cheese Makers' Association.

We have examined the accounts and vouchers of the secretary and treasurer and find them correct.

(Signed) JOHN GROOTEMONT,
JACOB KARLEN, JR.
J. W. CROSS.

On motion, duly seconded, the report of the executive committee was adopted as read.

The President: The next on the program this morning is an address on Market Requirements by Mr. J. B. McCready of Sheboygan, Wis.

MARKET REQUIREMENTS AND MARKETING CHEESE.

J. B. McCready, Sheboygan, Wis.

Mr. President, Ladies and Gentlemen: I rather felt like reading this paper from the floor but, after the invitation Mr. Grootemont had to come up, I felt I had better follow suit. I am not quite as big as he although lots of times I feel as large as he. I would prefer to read this from the floor for the reason that as a cheese buyer speaking to cheese makers I feel I would like to talk to you on the level, because we cheese buyers have a reputation of not being on the level, that is the idea of some cheese makers at least. However, we are not all in the same boat and those not on the level are getting very scarce.

This subject, or rather these two subjects, will permit of a good deal of discussion, yet I do not feel like taking up too much of your valuable time by going into detail to any great extent.

A thorough discussion on Market Requirements would entail a criticism on the various faults found in cheese, with hints and suggestions as to their improvement. But I believe this point will be more fully gone into during the reading of other papers, therefore I will confine myself to a few suggestions as to what a buyer of cheese looks for and expects when he pays top price for this commodity.

True, there is some slight difference of opinion among buyers and judges as to just what constitute a good cheese. Yet we are all agreed, espcially at least all dealers in Wisconsin, and those who find it necessary to store cheese and who require good keeping stock, are agreed that a good close bodied, meaty texture, even color and clean flavored cheese, is the one most desired. What we want is a cheese that can be shipped to any point in the United States. Some dealers may ask you to make a soft, open cheese for western trade, Iowa especially. This may be all right as far as it goes, but let that trade get stocked, and you find yourself with a bunch of soft, open stuff that you cannot sell elsewhere except at a loss. The West uses lots of good, firm, close cheese, and will use them more and more as they become educated to the fact that the firmer cheese keep best, and develop the finest flavors with age. I say to you, make a cheese that can be shipped any place.

At no time was the necessity for close, meaty cheese more clearly demonstrated than last fall when the bottom fell completely out of the cheese market. When this happened, our home market was as dead as a door nail. No one wanted cheese. Fortunately, however, our prices were in line with those of Canada and we were able to export to Great Britain. That is always a help. Unfortunately, however, we were starting to get soft, pasty cheese, and these we cannot export.

Aim to make your cheese uniform in size. Nothing looks more slovenly or careless than to pull the cover off a box of Young Americas or Long Horns and to see four cheese all of different heights and proportion.

There is entirely too much pasty cheese being made in this country in the fall of the year, and it makes me tired to hear some of you cheese makers saying it can't be helped. I say it can be helped if you'll cut out trying to make cheese from water and working for that almighty yield, that which helps enrich your farmers and impoverishes the reputation of Wisconsin cheese. Cook firmer and salt higher in the fall when milk is richer, pastiness is nothing but an over amount of moisture. I say quit working for that extra miserable pound, Wisconsin doesn't need your help to make her the biggest cheese producing state in the Union, she is that now, but you have got to help her to continue to be the producer of the best cheese in the Union. I say it is not necessary to make pasty cheese, and the sooner the dealers pay you for it according to its actual value, the better for all concerned.

Another thing that is not required of you is paraffining your cheese; of late years it is almost impossible to get small cheese from a factory but what are paraffined. Here you are working for that miserable pound again. There is no dealer but what would prefer to have your cheese not paraffined. The average factory is not properly equipped for this kind of work, and besides you paraffine before the cheese are properly dried and cured. The result is wax that cracks and peels off, and when they are paraffined too green that moisture that is held in causes pastiness, bitter flavor, and in lots of cases when cheese are placed in storage, sloughed or rotten rinds. The firm I represent, for one, will cease to buy paraffined cheese where the others can be procured, and I believe I am safe in saying, others feel the same way as we do.

I have tried to tell you what we like in a cheese and what we don't like. It's up to you to let these suggestions soak in, for I presume you are trying to make cheese that will please your buyers, while we in turn are trying to buy cheese that will suit our trade.

Under the head of marketing cheese just a few remarks before closing. Sell your cheese when possible on your Dairy Board of Trade, no factory within selling distance of a Board should sell any place but on that Board. It's all right for those who are far from a Board, or where there are not factories enough for a board to exist, to contract their cheese with some good firm for the season. But when you have a Board sell on it. The more cheese offered the more buyers will attend, the more buyers the keener the bidding and the better the prices paid. There are some Boards in this state that are bigger fakes than Barnum ever dreamed of. Imagine a great big majority of factories who are willing to sell their cheese based on the ruling price of some of these boards, where one or two lots of cheese make the price that governs the price paid two hundred factories, where a good man could eat all the cheese offerd for sale in a week, and where no buyer attends, for he couldn't make his car fare by doing so. I say, sell your cheese on the Boards when possible.

Put your cheese up in good, clean, well nailed boxes. You factorymen could get better nailed boxes if you would insist on it, and it's pretty nearly time to do a little insisting, for some of the boxes you use are poor.

I have had some little experience as a cheese maker, also some as a buyer, and by way of closing I want to say to you, that I have found the average buyer always willing to be square with you when you show a willingness to be square with him. When your buyer finds fault don't go up in the air. Just remember if he wants your cheese again he is surely making you his best offer, and remember that man does not live that can say he never made a poor cheese in his life, for we all have made them and will continue to do so at times, and when you do and your buyer offers you what they think they are worth, take it and make up your mind that mistakes cost money, and as long as you can help it there will be no more mistakes.

DISCUSSION.

The President: This is a good paper and I presume there are some questions you would like to ask.

Mr. Dassow: I would like to ask where we can get those good boxes.

Mr. McCready: I would not care to name the firms that make good boxes and those that do not, I would rather be a "booster" than a "knocker." I think if you get into conversation with some cheese makers today they will name them for you.

Mr. Dassow: I think it would be better to make them public. That would be the way to knock them out.

Mr. McCready: The idea is that there are manufacturers of boxes in this state that are putting out good boxes and the same manufacturers are putting out mighty poor ones; it depends a good deal on the rush and the amount of time they have to get them out in. Some of you people do not give them sufficient time and sufficient notice. The cheese boxes are not all made in your own nighborhood, you can get them from the outlying districts and some of those outlying districts are putting out as good a box as can be bought. The trouble with most boxes is they are not sufficiently nailed. I happened to be in Oklahoma and Texas last summer and I saw cheese come there from Wisconsin when there was not a box on any of them and it was due to nothing but the fact that the boxes were not sufficiently nailed. I do not care to name any of the firms making cheese boxes that are not good. I may not be a good judge of a cheese box and I might get into trouble with the makers.

Mr. Aderhold: We do not care about your trouble, tell us anyhow.

Mr. McCready: The worst cheese box made in Wisconsin today is made west of Madison. In Fond du Lac we got cheese that after we took them out of the box and paraffined them, they were so tight, the boxes being mostly square instead of round, that we could not force the cheese into them without scraping the paraffine off. The trouble with all the boxes are they are insufficiently nailed and a number are too green when they are brought in.

Mr. Dassow: I find in ordering cheese boxes two months ahead they will get too dry; we cannot keep the covers so they will fit, and they also get dirty standing around and are covered with cobwebs.

Mr. McCready: You are not supposed to have any cobwebs at your factory.

Mr. Dassow: In Canada, where I learned my trade we bought every cheese box that we used for the year (and we made over two hundred tons of cheese in six months) in the Spring and put them in the attic and other places we had for them over the curing rooms. We want our boxes dry and if they are properly made and nailed they will not fall apart.

Mr. Noyes: Is not the trouble that our boxes are too green? Some boxes you can put anywhere and they will always be good because they are made of material that is good and properly cured. I find one trouble is that a good many of our factories are making cheese for too little money and have to buy pretty cheaply to get anything out of it for themselves. Cheese makers ought to get together and establish a uniform price for making cheese so as to protect themselves. I think the cheese makers are the only people in Wisconsin that cannot work together for their own interest. If they would organize, get together and maintain their business they would be better off.

Mr. McCready: That is very true, Mr. Noyes, and no doubt that matter will be taken up later on in some other discussion.

Mr. Dassow: Take a green cheese box and the cover and bottom are always dry. As far as the veneering goes, that dries out in a very few days.

Mr. McCready: I do not think Wisconsin has more brains than Canada but I know they make a cheese box in Canada that does not dry up and blow away. The cheese boxes I spoke of that we bought in the spring of the year were wet when they came in but were dry when we used them; the cheese box held together and that was all we wanted. They can put the veneer on tight enough so they will hold because lots of them are holding while others are not, and there are some places where the boxes are not properly made. I want to say to you, Mr. Noyes, before I go any further, that there are good cheese boxes made in your district but I have found boxes there perfectly green that when they became dry, without a cheese in them, became square. That is not a cheese box.

Mr. Grootemont: What is the price of the Canadian boxes?

Mr. McCready: Of course I have not made cheese in Canada for about ten years, but at that time we were using a box 14½ inches deep and 13½ or 14 inches across, and those boxes cost us twelve cents laid down in our factory. Today they are costing fourteen cents, but there is more material in them than in one of our Twin boxes.

Mr. Aderhold: I think we ought to keep Mr. McCready up there until 12 o'clock. He intimated that some of the cheese dealers, not many but just occasionally one, was not on the level. From reports that I hear occasionally, if they are true, we have to conclude that occasionally a cheese buyer steals outright from a shipper. Mr. McCready, do you think that happens occasionally?

Mr. McCready: Yes I have known it to be true.

Mr. Aderhold: What action ought a Board of Trade take for their own protection as sellers when such is the case?

Mr. McCready: I think a man of that caliber ought to be ruled off the Dairy Board of Trade and kept off. I do not think a buyer should be allowed to buy on a Board of Trade until properly investigated. They had that experience in the Clintonvilled istrict where a man came in there and bought cheese. They are looking for him yet. The people I am with wanted to start a warehouse in Clintonville and I went up there shortly after this fellow had escaped. I was known to most of the cheese makers but the minute I said that we were going to open a warehouse and would take in their cheese, giving them the same argument as the other fellow, I had to "skidoo." I think action should be taken by a Dairy Board, if it can prove a fellow is not honest or square. I do not think there are many dishonest buyers but when they do find one, I think that man should be ruled off the Board.

Mr. Aderhold: I agree with you, they nearly all are square, and yet assuming that those honest and square dealers knew they would be ruled off the Board of Trade if they did any stealing, there would be less stealing today just the same with those honest and square ones, for instance when a buyer has the goods and the money and will settle according to his own figures.

Mr. McCready: I want to tell you something that will surprise you. I had an idea at one time that the only square man on the job was the cheese maker, that every buyer was an out and out crook. I had to change my opinion, not only from the fact that I was a cheese maker but also a buyer, and it will surprise you to know the amount of cheese that does not come out full weight, surprise you to know the Daisy cheese that comes out two pounds short, and it will surprise you to know the fellows that send them in very often. Had I been on my way here from Sheboygan instead of from Canada. where I have been on a visit, I would have brought down an exhibit that would have shown you that one cheese maker in Wisconsin is a crook. I have a cheese that the mice lived in for six months. It was supposed to be a 20 lb. Daisy and it weighs seven and a half pounds. It had a piece of cheese rind inside and paraffine over it.

Mr. Taplin: What would you do with a buyer that buys a lot of cheese and if the cheese drops a cent or two on the

Board, will find fault with the cheese which he previously had pronounced as all right?

Mr. McCready: There is scarcely no cheese but a man can find fault with if he is looking for trouble.

Mr. Taplin: This man said "The cheese is o. k. but the market has dropped so I cannot give you the money."

Mr. McCready: I would have sued him for it. We have fellows that write us our cheese is off and it would surprise you how many off grades there are in the market when the market drops, but I would have sued him, that is all, and would see he never bought another cheese from me.

Mr. Linzmeyer: How much do the cheese weigh for the market weight when they arrive at the warehouse?

Mr. McCready: We call for strong up-beam not balanced weight, and take a quarter of a pound over.

Mr. Linzmeyer: If the beam strikes up it is weight?

Mr. McCready: That is what we call weight. There is no rule covering that here but there is in Canada. On the 80 lb. cheese there you can afford to give a little stronger weight than weighing up 20 lb. Daisies. Cheese weighing 81 lbs. and which would not go 81½ strong we call 80 lbs. If it weighed the half pound strong, we called it 81 lbs. That is up-beam. Of course those cheese were taken all over Canada, none of them paraffined, and they lost two or three pounds in actual weight on every cheese they store and to a certain extent they are entitled to strong weight. If you are shipping in your cheese paraffined, do not think because they are paraffined that just the swing balance ought to be good enough weight because paraffined cheese will shrink, but I think I would prefer to give any buyer a quarter of a pound over.

Mr. Linzmeyer: That is what we always figure, but one buyer claims the dairy and food laws require a quarter pound over.

Mr. McCready: They do not; he made that law himself the day he wrote you.

Mr. Linzmeyer: I saw the cheese weighed and he would not give weight unless there were a quarter over at the warehouse. We weighed the cheese at the factory and they were a quarter pound overstrong.

The President: If they weighed 20½ lbs. would he call them 20 lbs.?

Mr. Linzmeyer: Oh no. We had 40¼ lb. cheese and he wanted them to weigh up at that. If they did not he docked one pound.

Mr. McCready: That is not right. There are several cheese makers in the audience, I presume, from whom I bought cheese this summer. One cheese maker in particular, whom I do not think is in the audience, but if he were I would call on him to give his experience in weight. He was only about a mile and a half out of Clintonville and Mr. Splitgerber (I mention the name so you may refer to him if you wish) was weighing his curds in the factory and supposed he was giving good strong weight. He shipped his cheese to us and we found them from a quarter to a half pound short each box, and we cut him five on five. We wrote him and he came to our place, bringing with him a cheese in the buggy, having weighed the cheese not five minutes before he started. He came into the warehouse himself, put the cheese on the scales and found while he had given ⅝ of a lb. over in the factory it was a quarter pound short on our scales. Our scales had been inspected, and not only that but pretty nearly all the other cheese in the warehouse held out in weights, so he convinced the farmers there that they had better get him a new pair of scales. He got me to order the scales for him and I have not cut him on weights since.

Mr. Linzmeyer: When you see cheese weighed in the warehouse and they weigh one quarter of a pound over you are entitled to your weight, because in most cases you get it if they only go one eighth of a pound over.

Mr. Aderhold: I think in places where there is a sealer of weights and measures, it would be only proper to call him in.

Mr. McCready: The sealer calls at our warehouse in Sheboygan every two weeks and we also have him come in and weigh cheese occasionally. It depends on the man you are doing business with. If I buy your cheese, and find them short weight I am going to cut you on full weight and write and tell you about it; if the fellow sitting alongside of you had short weight I would cut him but I would not write and tell him of it until I sent him his check because I know him and he knows that I would not cut him on short weight unless he was entitled to it.

Mr. Wallace: If you found a cheese weighing 61 lbs. and higher, would you give the other fellow the extra pound?

Mr. McCready: No sir.

Mr. Wallace: In weighing cheese you cannot always get them within a quarter of a pound, you may get them three eights or just up balance. I make a practice if they balance up to mark it full weight and if three quarters over give it to the buyer. It looks to me like a small piece of business for a dealer to give a maker short weight on a short weight when he has a whole lot of cheese that weighed over, for which he allowed the maker nothing. If he would give me credit for the pound if I were a full pound over, I would not blame him for cutting me on trifle short weight.

Mr. McCready: Those full pounds over come so very infrequently that I would be willing to give it. If your cheese usually runs a half pound or three quarters of a pound over, I do not believe a dealer who considers himself a dealer ever would cut you for a cheese that just balanced beam. We only weigh five cheese and the chances are we will not strike the one that just balances. We have four others running a half to three quarters over, and when I find a fellow giving those kind of cheese I would not cut a pound on five.

Mr. J. G. Moore: Referring to the statement that there is a kick once in a while on weights, does the buyer ever get a kick from the fellow that buys his cheese? You have to give that man up-weight, don't you? Is he going to allow you for a half pound?

Mr. McCready: He never has yet.

Mr. Wallace: Will not the paraffining make up for that weight?

Mr. Noyes: I find lots of cheese makers weigh their curds and on the average weigh them 20 lbs. up weight; when that goes along straight they will reduce that an eighth of a pound; if it still goes along straight they will reduce it an eighth so as to get a big yield. When it gets to the warehouse it falls short and the cheese maker goes there and says "I weighed that the same as I did all summer." He is looking for the almighty yield. The dealer has to guarantee weight and has to have full weight, if he gets three quarters of a pound over on a sixty pound cheese he cannot sell that for 60¾ lbs., he must sell it for 60 lbs.

Mr. Wallace: That is all right when they weigh correctly, but I do not see how it is possible for a man to weigh accurately when they go on the scale.

Mr. McCready: It would surprise you to know how accurate some old committees are that weigh cheese; it would surprise you to know how active they are in going around the factory to pick two Twin cheese that will swing the beam right; they do not pick out the first cheese and put it in the box. I got cheese at one time where two old fellows were on the committee; they each took a week in weighing out the cheese and I knew the week one of the old fellows was weighing the cheese; he had all the time he wanted but he never made a cent by looking for the cheese that would just balance up, because he was invariably cut for short weight.

Mr. J. W. Moore: Do you think it right for a cheese dealer to cut a man on a certain day's make of cheese? Say he has ten days' make in a shipment and he has five boxes that are very bad, is it right for the dealer to cut a fraction of a cent on the full shipment or only on the cheese that is defective?

Mr. McCready: It is neither right nor fair to cut him on the entire shipment. I do not know what each man's system of receiving cheese is, but when cheese is sent to us we go through all the cheese before we take any weights. We prefer to have all the cheese dated, and it is a good idea to date your boxes. Most cheese makers put their date mark right under the weight mark, and I presume this will be discussed in another paper. It is a good idea because it gives a dealer an opportunity to go through the cheese rapidly and if he has confidence in the cheese maker it only takes him five minutes to go through a lot of cheese. If we find one day that is off we aim to set out those dates, receive all the good ones under one lot number and all the poor ones under another, so when we go to pay a man we may be a Young America shy in the exact number of cheese he made that day, and when we settle with him we tell him there were eight boxes we had to cut.

Mr. J. W. Moore: I do not think this is altogether the dealer's fault. To an extent it can be blamed to the cheese maker because if the milk in the neighborhood is running bad a certain month the farmers cannot expect the maker will get No. 1 cheese and he should so advise them.

Mr. McCready: I have heard of a firm, when a day's make was off, cutting the whole shipment one-eighth to a quarter instead of cutting that one day but I do not believe in that method and do not follow it because if I were to buy one day's make for three cents and paid 12½ cts. for the next day's make, I do not know how I could have balanced it up in order to cut him on the whole lot.

Mr. Noyes: The times such things occur are when the cheese are all mixed up and without date, and poor cheese are in the bottom of the box, then we size the lot up and pay for them what we think the lot is worth. The trouble is in mixing up the cheese, and there are cheese makers that do not have time to date their cheese or boxes. Some cheese makers have time to do all those things and we always find their factories in good order and his cheese in nice shape, and if he has poor cheese he will tell you about it. That is the man that gives the right weight and a dealer never has any trouble with that kind of man. Those cheesemakers do bob up here and there all over every section I have ever been in, and I also find there are some poor cheese makers that try to get through with just as big a yield as possible and with just as little trouble as they possibly can.

Mr. Wallace: Wouldn't a cheese maker get a little better treatment from a dealer if he ships to him all the time than if he ships to him only once in a while?

Mr. McCready: We are supposed to pay for cheese what they are worth.

Mr. Wallace: Is it not a fact that the dealer finds more fault with the man he buys from only once in a while than with the man from whom he buys regularly?

Mr. McCready: A man shipping his cheese to us year in and year out is doing us a certain favor. When another buyer goes in and solicits his cheese for an extra eighth of a cent, he does not go over to the other fellow, he sticks, and naturally when a man sticks to us we will stick to him.

Mr. Wallace: If you come up on our Board of Trade and buy cheese from me and do not do as well by me as the other fellow who has been buying from me, I will not sell you the next time.

McCready: I did not know you were referring to cheese bought on the Board of Trade. We buy your cheese perhaps once in a while on the Board of Trade if your cheese are all right and if we want them bad enough we will accept them and pay the market price for them.

Mr. Wallace: There is a difference between all right and something that is better and when you find somthing that could be better and is all right with a steady dealer, is it all right with me if I ship you every six months?

Mr. McCready: If I buy your cheese and they are marketable of course they are all right. I am talking about marketable cheese and that is all we are trying to buy on the Dairy Board of Trade.

I know a good many fellows that had cheese contracts this year off the board that were glad to come in and put them on the board and also write us and ask if we wanted to take them. I know that the cheese that are contracted off the board, in our section of the country at least, and shipped to any dealers are not suitable cheese for us to buy after they bring them back and put them on the board. Some dealers. especially where you ship to a wholesale grocer, will get you to make soft open cheese, and a great deal of this soft, open cheese was offered on the board this fall and seldom were they not cut until they got back into the proper system of making cheese, that is making cheese that will go anywhere in the United States or the Old Country, a good, firm, close cheese I do not care who wants it. We found this out last fall when we started to export. Out of all the Americas on the board one week we were only able to ship half of them, because the balance were too pasty and we would not take a chance at them. Some cheesemakers I presume do not want to come to the Dairy Board, cannot get away from their factories long enough.

Mr. Dassow. A dozen of cheesemakers go to the Plymouth board regularly and never sell a box of cheese.

Mr. McCready: It may be they are making a special cheese of some kind.

Mr. Dassow: I have been in the factories and found nothing different from the ordinary make of cheese.

Mr. McCready: Every man is entitled to sell his cheese as he sees fit. I cannot give you each man's reason for not selling on the Dairy Board but the man who sells on the board often gets the extra one-eighth of a cent, the other does not.

Mr. Dassow: It seems to me the only object that those fellows have in contracting their cheese and not selling it on the Dairy Board is to let somebody else do the dirty work.

Mr. McCready: I do not think anybody selling off the Board of Trade gets any better usage than the man selling on the board.

Mr. Dassow: I would like to ask if every cheesemaker would paraffine his cheese would we have better cured rinds?

Mr. McCready: I can take you to Sheboygan today and show you cheese where I can shove my finger into the rinds due to nothing else than the cheesemaker paraffining his cheese right out of the press. A cheese cures and develops and shows almost from the time it is four or five days old what it will develop into, but paraffining wax does not tell you anything of that kind. If we could make a moisture test of every pound of cheese that comes to our warehouse we could tell which to hold and which not to, but it takes a good judge, when a cheese is five days old, to tell whether to put that cheese in the warehouse or not. If you get your paraffine wax too cold and get it on almost an eighth of an inch thick that cracks off; the cheese is put in a cooler and where the wax is off the rinds become mouldy; if you paraffine them too soon they are wet, the moisture has not had a chance to get out, there is too much moisture there and the result is it forces itself as far as the rind and causes a rot. I have seen that too often to suit myself. Paraffining cheese is a mighty fine thing for the cheese dealer to save a lot of shrinking and to save a lot of black, dirty cheese, but it is not the best thing in Wisconsin for the flavor of cheese, and I can almost wager my life on it. Canadians do not paraffine their cheese. Last week over there I got some cheese nine months old and every cheese had a flavor to it that our cheese do not have at that age. Our cheese will develop a sharp, bitter flavor which those cheese did not have. They get what they call "nutty flavor cheese," and we do not.

Mr. Dassow: Is it not a fact that there is something else to blame for it, is it not too much moisture? I do not think paraffining is to blame.

Mr. McCready: Why not? Paraffining is holding in too much moisture.

Mr. Dassow: In our neighborhood we are working for yield. Everybody puts in as much moisture as he can.

Mr. Kong, Iowa: I have been in the cheese business twenty-five years and sometimes buy cheese in Wisconsin, and I am sorry to say they have been short in weight every time I have received them, and I always write to them not to paraffine the cheese. I find I have no sale in Iowa for paraffined cheese. In a town where I am selling cheese the grocers will not take paraffined cheese, claiming it will not keep well. Between the paraffine and rind it moulds and gives the cheese a bad apparance when cut. I always object to paraffined cheese. My cheese keeps better when not paraffined than when paraffined.

Mr. McCready: The fact of your cheese showing mouldy under the paraffine would indicate they were a little mouldy before paraffining, but did you ever notice the rinds get soft? Paraffining cheese has not improved Wisconsin cheese, I will tell you that.

Mr. Kong: I bought cheese the other day which a man had paraffined. He kept them in the basement and he showed them to me and asked me what was the matter with them; I told him they were too wet.

Mr. McCready: You spoke about short weights. I am not going to deny the fact that you can get short weight cheese from Wisconsin dealers but if you were buying paraffined cheese you wiuld be less apt to get short weight. Your other cheese does shrink in weight more than the paraffined but if you have not paid for the cheese, pay for what you get. I am not plugging for trade, but if you buy your cheese from me I will guarantee you will never get short weight. We have a law against marking boxes incorrectly, and I hope it will be enforced because there are cheese dealers in Wisconsin that are just as anxious to see every man get full weight cheese as the man who buys it.

Mr. Ide: I have seen a number of cheese buyers if a cheese came in weighing 20½ lbs. they would scratch out the figures and mark that cheese 21lbs. I have seen that done myself.

Mr. McCready: I have seen it too, I do not deny it.

Mr. Ide: They have been marked up as high as one and one quarter to one and one half pounds.

Mr. McCready: You understand that the first of January the National Pure Food law went into effect. This law requires that all dealers give full weights, and a good many dealers became honest the first day of January last year.

Mr. Ide: But a good many dealers forgot to become honest because they kept on the same way this year as last.

Mr. McCready: I feel I am in a position today where I am apt to be jeered at. I am between the cheese maker and the cheese buyer, but on the first day of January a good many became honest and a good many remained there and we are hoping the balance will be compelled to be made honest before another first of January, because it just means that the dealer who marks up cheese can underquote and undersell the man who sells full weight.

Mr. Ide: I think we will have to have different laws before we can compel the dealer not to mark up his cheese because he marks up the cheese and then puts them into storage and when the cheese come out of storage short he says it is because of shrinkage, and he will not sell them by the pound but by the box.

Mr. McCready: No cheese is sold by the box except square cheese, nothing but square cheese is sold by the box and that is the only cheese unless a man guarantees that he will ship Daisies that average 20 lbs. We have factories that make us nothing but 20 lb. Daisies; they do not mark the weights on them but we mark them 20 lbs. because we want the trade to know they are 20 lbs. and when we buy 20 lbs. of cheese and pay our money for it we are supposed to get it.

Hon. J. Q. Emery: I would like to ask whether dealers in Wisconsin cheese have been the only sinners in this matter of underweight and overweight?

Mr. McCready: I think not.

Mr. Emery: Has it been as common among Eastern dealers as in Wisconsin?

Mr. McCready: It has been know in the East but I think it has been more common in Wisconsin than with Eastern dealers. There is one thing, Mr. Emery, Eastern prices on cheese have been much lower right along than in Wisconsin and there has been a certain temptation to mark up our weights so as to equalize our price with New York, but I think the majority of cheese dealers are giving full weight cheese and if you know of any dealers giving short weight cheese I would much rather have you report them.

Mr. Emery: I shall have no hesitancy whatever. I should have pleasure in getting after them.

Mr. Schwingel: Should all paraffined cheese go into storage at once?

Mr. McCready: Certainly, paraffined cheese must not be allowed to stand around and blister.

Mr. Schwingel: I think right there is where a good deal of the trouble is.

McCready: When we are paraffining cheese in the warehouse that are going to be shipped or are going into cold storage, they are not over five or six hours on the floor any way you take it. Where a man paraffines his cheese in the factory he paraffines some every day, then boxes them and ships them out. I have seen cheese come in in hot boxes and they were brought into our warehouse very hot and blistered. Let the cheese dealer paraffine the cheese. That is his business. We can buy paraffine at six cents a pound and do not care to pay 15¾c for it.

Mr. Schwingel: I do not think there is any benefit to cheese makers to paraffine cheese in the cheese factory.

Mr. McCready: Where a man is working for yield, yield all the time, he is going to get into trouble. That is one of the things that makes Canada what it is in the cheese business. The last thing we thought of was yield, the first quality.

The President: I have heard some cheese makers say the cheese buyers complained because mould set in on cheese before it reached the dealers and for that reason they paraffined their cheese. Now where they have no curing rooms I think it is possible that that will cause more trouble than paraffining the cheese. As far as paraffining cheese and keeping it in the ordinary room temperature is concerned, I would say that during the past summer at the dairy school we paraffined all the cheese sent in by exhibitors, and a good many of them came in oniy a few days old. We paraffined them and put them on the shelves for a month and most of the time the temperature was between 60 and 65 in the hot months, and I found no trouble with the paraffine cracking in that temperature.

Mr. Schwingel: How old should a cheese be before paraffining it?

The President: I cannot answer that question. I think Mr. McCready stated that it all depended on the amount of moisture in the cheese, some cheese you might paraffine when a few days old, other cheese you would have to keep ten days before paraffining.

Mr. McCready: The chairman used the argument of paraffining cheese to cover up poor curing rooms. The money spent in the paraffine tank and the time used in paraffining, would build a curing room which would prevent mould.

Mr. J. W. Moore: I think it is possible to fix up a cheese that is mouldy so as to make it look fairly decent, but take a cheese that is paraffined too early in the factory and how can it be treated to get rid of the slime that will be there? I have seen cheese that came in slimy and the dealer took off the bandage; then of course the cheese was slimy and he scraped that and let it stand in a draft for several days and yet it was slimy. Slimy cheese cannot be corrected while mould on cheese can be helped.

Mr. McCready: I would rather clean up mouldy cheese and paraffine them after they were dried. It is worth money to wash cheese and the man that has a curing room that moulds cheese should be charged by any dealer for washing those cheese up, but I would rather have mouldy cheese than cheese with the wax cracked off. There is no way to get paraffine to stick on that.

Mr. Wallace: Which would you rather have cheese come in with a cap cloth or with a circle?

Mr. McCready: For my part, I learned my trade making cheese where we stuck to heavy cap cloth but where you use a heavy cap cloth you have to use warm water to get the cloth to stick and you can get a better rind than by using the circle. I have had cheese without cap cloths that suited me and I have seen them from other factories where the rind had chipped and mould worked in where they used cap cloths, and this would not have been the case had they used a circle because they did not use the cap cloths properly.

Secretary Baer: I want to announce to the convention that I am reliably informed that this afternoon we will have one of the best Swiss warblers in the state, and we will have a quartette and a double quartette to sing for us. We will also have people from the various theaters in the city here to entertain us from time to time. Do not forget to visit the second floor of the Republican Hotel where the supply men are keeping open house and desire to meet you. They are the men who have been in the convention, the men behind the gun, have helped to finance it and make it possible for us to continue year after year to hold larger and more successful meetings. They have been largely instrumental in making it possible for your officers to get out what I have been told by a number of delegates in attendance is a pretty decent looking program. They have paid lots of money for the advertising and they are now at the Republican Hotel and would be glad to see you.

On motion duly seconded, the meeting adjourned until 2 o'clock P. M.

WEDNESDAY AFTERNOON SESSION.

January 8th, 1908.

Meeting called to order at 2:30 P. M. by President Michels, and opened with music by Matti Brothers, the Swiss Warblers.

The President: At this time I will appoint the committee on resolutions which will consist of Messrs. E. L. Aderhold, of Neenah, J. W. Moore, of Madison, and P. H. Kasper, of Welcome.

The next on the program will be an address by Mr. J. G. Moore of Madison, Wisconsin, Secretary of the Wisconsin Buttermakers' Association and also Secretary of the Dairy Manufacturers and Milk Producers Protective Association.

ADDRESS.

J. G. MOORE, Madison, Wis.

Secretary Wisconsin Buttermakers' Association.

Mr. Chairman, Ladies and Gentlemen:

I have heard it said that sometimes it is a good thing to have two strings to your fiddle and so in my address today I have two subjects for discussion. The first subject, in regard to the matter of cream rates, may seem to you as cheese makers as a subject foreign to your interests but I hope by the time I finish to have shown you that it is something in which you are deeply interested.

A subject that I think you will be interested in is whether Wisconsin's cheese and butter interests should own, control and publish a paper devoted to their interests?

Most of you are no doubt familiar with the fact that a paper under the name of the "Cheese and Dairy Journal" was published at Whitewater for a time, and was two years ago made the official organ of this association.

At the time of the suspension of the Cheese and Dairy Journal the paper was offered to some of us who thought at the time that it could be made successful, with a little financial backing, but were discouraged by a prominent newspaper man who being asked for advice told us that the road of journalism was strewn with the wrecks of suspended publications, which is no doubt true.

At the beginning of the short life of the Cheese and Dairy Journal it made no effort to appeal to the creamery interests for support, but later finding that there was not enough advertising to be obtained for an exclusive cheese paper, decided to enter the creamery field, but it was too late, and not having sufficient financial backing was sold to the only paper that makes any pretension of catering to the cheese interests.

Now with such an example before us, it may seem the height of folly to again venture upon the sea of journalism, but we have another example to show you, viz.: The Dairy Record, of St. Paul, Minnesota. This paper has been in existence for nearly eight years and is owned entirely by the Minnesota State Butter and Cheese Makers Association; not always, but its success as a paper has been made sure and solid since the stock has been entirely in the Association's hands and the Makers of the state have a greater interest in it. Naturally owing to the fact, that they are the owners.

I have been investigating the subject of pubishing a paper somewhat, and I want to lay before you the results.

When the Cheese & Dairy Journal suspended publication it had advertising contracts sufficient to pay for the printing and mailing the paper; the greatest trouble was that it cost so much to get subscriptions, many times even more than the price of the subscription.

It seems to me that if the Wisconsin Cheese Makers' Associa- and the Wisconsin Buttermakers' Association were to join forces in the matter that it could be managed in such a way as to insure its success.

With more than 3,000 cheese factories and creameries in the state as a field of operation, it seems to me that the field is large enough, and when our makers know the paper is their own that they are patriotic enough to stand by it.

Wisconsin cheese and butter interests have problems peculiarly their own and could best be treated in a paper owned by themselves.

As to the method of control I should suggest that the officers of the two associations be a board of directors to formulate the policy of the paper and to select the editors.

By the way, I want to say that your secretary. Mr. U. S. Baer was the man who did Herculean work in the way of making the Cheese and Dairy Journal readable and instructive to the cheese makers, and I know that if we ever have a paper no mistake could be made in selecting him as editor of the cheese end of it. His heart would be in the work and with his acknowledged ability as a writer, and his knowledge of the cheese business from A to Z and his wide acquaintance, I can almost assure you of the success of the undertaking.

I have talked with some of the advertisers and some of them said they thought it would be a good thing, and others thought there was enough papers as it was.

In talking with the editors of the Dairy Record in regard to this, they were to my mind rather disposed to throw cold water on the project and said that most firms these days set aside a certain sum for advertising, and should another paper start up it would only mean a smaller amount for each one.

They advised that our association make their paper the official organ, but, personally, I do not think that Wisconsin with its great dairy interests should be the tail to any other state's kite.

Should this association deem this idea of an association owned paper worth further consideration I should suggest that a committee be selected to look further into the matter and co-operate with a like committee from the Buttermakers' Association.

I want to say this in conclusion that it is not with any idea of providing a soft job for some one that I advocate the establishing of an association paper, but on the contrary, I know that Mr. Baer, myself and others will be more than willing to do all we can for the interest of the paper and give it such service as can not be purchased with money.

At the convention of the Wisconsin Buttermakers' Association held in Wausau last February, Hon. J. Q. Emery, Dairy & Food Commissioner of Wisconsin, had the following to say:

"In my judgment, never in the history of this state has the local creamery industry been so menaced as at the present time. If our local creamery interests in Wisconsin, this magnificent dairy state with a total annual income from her dairy products of more than fifty-seven million dollars, is to continue and advance that industry, there are certain conditions that are absolutely indispensable. First and foremost, cleanliness in dairy products from cow to consumer; second in our creamery work the testing of butter fat in cream or milk of the patron must be done with intelligence, with painstaking care, and with absolute honesty; third, there must be no discrimination in railroad transportation by the roads between the various classes of producers of these dairy products.

Now, gentlemen, this is a serious proposition and there is no body of men so called upon to deal with this proposition as the Wisconsin Dairymen's Association and the Wisconsin Buttermakers' Association. I state to you things that I know, and I say that a local creamery is charged one dollar a hundred to ship its butter to Chicago by express. Now keep that in mind; at the same time, from the same place they take one hundred pounds of cream to Chicago for 26 cents. The cream is 40 per cent butterfat. Now, under the arrangements, a large portion of this cream shipped to Chicago centralizers averages 40 per cent butterfat. It amounts to this, that the Chicago centralizers get their butter for 52c a hundred for transportation charges, while the Wisconsin local creamery pays $1.00 to get its butter to Chicago. Gentlemen, that is not a square deal. In addition to this, the railroads return the cream cans free of charge, they do this by shipping as baggage.

Thus it will be seen that by this action of the railroads the Wisconsin local creamery is placed in a position of particular hardship if this thing continues. No Chicago centralizer nor any other centralizer can get out of a farmer's cream any more honestly, than the local co-operative creamery can get out. Therefore it is to the interest of every Wisconsin farmer to stand by the Wisconsin local creamery. He gets all there is in the over run, and everything! The dairy sentiment of our state, the railroad commission and all the forces of our state should stand like a solid wall in defense of our dairy interest as a part of Wisconsin. Not only should they stand as a stone wall, but should be just as aggressive as a mighty army seeking to gain what is right and just in these matters. The Creamery Buttermakers' Association can do much to bring this matter to a right turn."

At that time a resolution was passed, as follows:

"WHEREAS, Under the present railroad rates in portions of this state a local creamery paying a dollar a hundred to ship its butter to Chicago by express is competing at the same time with Chicago centralizers that secure rates on forty per cent cream shipped as baggage at twenty-six cents per one hundred pounds and the cans returned free; thus enabling the Chicago centralizers to obtain a transportation rate of fifty-two cents per hundred on their butter; while the local Wisconsin creamery must pay one dollar per hundred to get its butter to Chicago, therefore be it

Resolved, That such discrimination in transportation charges by the railroad is not a square deal to the local creameries and their patrons.

Resolved, That this discrimination in charges is a serious menace to the local creamery and the dairy interest of the state; and that the officers of this Association are hereby requested to urge this matter upon the Wisconsin Railroad Commission and the National Interstate Commerce Commission for the purpose of securing justice in transportation to the Wisconsin local creamery and their patrons, and that they secure the co-operation of the dairy and daily press in arousing and reporting the dairy sentiment of this state in securing equitable rates."

Very few present at that convention really understood the importance of the subject brought up by Mr. Emery's remarks and also covered by the Resolution.

A number of the leading creamery men of the state, however, had been feeling the effects of the cream being shipped out of their territory and when Mr. F. A. Seeber, of Roach & Seeber Co., Waterloo, issued a call to meet in Watertown July 30th, at the Commercial Hotel, quite a large and representative gathering of those interested in the creamery business were present. After a general discussion of the reasons for making the call, a permanent organization was formed under the title of the Wisconsin Dairy Manufacturers & Milk Producers Protective Ass'n, with Mr. F. A. Seeber of Waterloo, Pres., A. L. Roach of Waterloo, Vice-Pres., Mr. H. W. Sorge, of Reedsburg, Treasurer, and J. G. Moore, Madison, Secretary.

The following Resolution was ordered printed in the form of a petition for distribution to the creameries and cheese factories of the State:

"To the Honorable, The Interstate Commerce Commission,
Washington, D. C.

WHEREAS, It has come to our notice that the so-called centralizing companies located in Chicago, viz: The Beatrice Creamery Co. and the Blue Valley Creamery Co. have petitioned your honorable to maintain the low rates heretofore enjoyed by them for the transportation of cream, alleging in their complaint that the railroads have entered into a conspirarcy in restaint of trade, and

WHEREAS, We, the representatives of the dairy industry of of the state of Wisconsin, the leading dairy state affected by the maintenance of such low rates, with its 3,000 creameries, cheese factories and skimming stations, with $5,000,000 invested in machinery and buildings, with 102,000 patrons milking 944,000 cows, contributing 3,166,000,00 pounds of milk annually with a revenue of more than $57,000,000, believing, as we do, that these rates in question are now entirely too low, and in our judgement tend to concentrate the industry in the hands of the few to the detriment of the many, and

WHEREAS, The so-called distance tariff is employed in computing rates on cream locally and the rates enjoyed by these Chicago companies are in their very nature monopolistic and destructive of the best interests of the producer, we, the representatives of the dairy industry of Wisconsin respectfully petition your honorable body to disregard the petition of the said Chicago companies and maintain the distance tariffs on cream."

A notice was sent with the petition calling attention to the importance of this matter to the dairy interests of the state and asking the maker or factory man to obtain as many signatures as possible.

At the meeting above referred to the following persons were named as a committee to go to Washington to represent the state at the hearing; before the Interstate Commerce Commission: Hon. W. D. Hoard, Ft. Atkinson, Hon. J. Q. Emery, Dairy & Food Commissioner, Madison; F. A. Seeber, of Roach & Seeber Co., Waterloo; E. C. Dodge, Pres. Wisconsin Buttermakers' Association, Lake Mills; J. G. Moore, Rep. Fox River Butter Co., Madison.

You may wonder, as cheese makers, how all this interests you.

St. Paul once said, referring to the Church, that it was all one body, although composed of many different parts; and that one member could not say to another I have no need of thee. And further: "And whether one member suffer, all the members suffer with it."

So it is with the dairy business, the man who is interested in the manufacture of cheese cannot say I am not interested in what pertains to the making of butter; nor can the butterman say I am not interested in what affects the cheese maker. What affects one is bound to affect all, and therefore I have taken the liberty to present this subject of cream rates to you so that you can realize your interest in the matter and take such action as will protect not only yourselves but the creamery and dairy interests as well.

For years milk has had to be transported into the large cities for immediate consumption and the railroads have had in force a terminal tariff which covered shipments from any distance up to say 50 or 100 miles.

Since the introduction of the hand separator a change has taken place in some localities, in the way in which the producer markets his butter fat. He used to haul the milk daily to the nearest creamery and bring back the skim milk for feeding purposes. Now by having the separator on the farm, he can hold the cream on the farm a longer time, and reach out to markets other than the one in his intermediate locality. Taking advantage of the low rates the force for transporting milk, so-called centralizers have been established drawing supplies from a large territory. In some states where dairying has not reached the development it has in Wisconsin or Minnesota, this method has possibly proved a good thing, but in states like Wisconsin and Minnesota when the local cream and cheese factories are so numerous that the producer has the benefits of the keenest kind of competition, it is seriously questioned if the introduction of this factor in the dairy business will prove a blessing.

In states like Kansas and Nebraska, Wyoming, Colorado, where the centralizer has been longest at work competition has indeed been reduced to a minimum. The large aggregations of capital looking about for new fields to conquer siezed upon Chicago as a favorable place to locate and induced the railroads to extend the distance that the terminal tariff would operate in.

Possibly the railroads thought by giving a low rate the producer would get the benefits and dairying along their lines be developed thereby. Claiming that the business is conducted under these low rates was unprofitable to themselves and that the producer was not getting the benefit, the railroads promulgated a tariff raising the rate slightly and putting into effect what is known as the "Distance Tariff" which is the tariff under which all butter and cheese is shipped.

The centralizers claiming that such raise in rates would ruin the business asked the Interstate Commerce Commission to interfere and restrain the railroads from changing the tariff.

As the interstate Commerce Commission is notoriously behind with its work the centralizers appeared before Judge Kohlstaat of the United States Circuit Court and asked for an injunction restraining the railroads from changing the rate until such time as the Interstate Commerce Commission could hear and determine the justice of such proposed increase in rates.

Under stipulation of the attorneys of both sides I believe this injunction is now in force.

The Wisconsin Dairy Manufacturers & Milk Producers Protective Association deemed it necessary to ask the Interstate Commerce Commission to allow them to be represented in the hearing and its officers were instructed to engage a lawyer to look out for Wisconsin's dairy interests.

Mr. John Barnes, former chairman of the State Railroad Commission was secured to represent the association, and as you all understand the movement of this kind requires financial backing the following circular letter was sent to every creamery and cheese factory in the state:

"To the Butter and Cheese Interests of Wisconsin:

Are you aware that a case of vital importance to the dairy and cheese interests of this state is now pending before the Interstate Commerce Commission in which such interests are represented, and that another such case is pending before the Railroad Commission of Wisconsin, and it is to be heard Oct. 19th.

Did it occur to you that by reason of Preferential rates whereby cream can be transported great distances at a trifling cost the butter making business is being concentrated at a few great plants in a few large cities, and that unless relief is had the same conditions will exist in Wisconsin?

These concentrating plants with their millions of capital by the appication of Standard Oil methods have already conquered Kansas, Nebraska, Oklahoma, a large part of Iowa and Illinois, a portion of Minnesota, and are beginning to add Wisconsin to their long string of scalps.

It is difficult to go into detail in reference to their operations in a letter of this kind. A single example will illustrate. Less than ten years ago, before the concentrating plants began their career, there were nearly two hundred creameries in operation in Nebraska. Now the number has dwindled to sixteen. Practically the same results have followed in Kansas and the loca creameries were shut out of Oklahoma from the start. Like results have followed in other sections where the trust has be operating.

The method adopted by the concentrators is to pay high prices for cream in new territory where they come in contact and competition with the local creamery until the latter is forced to suspend operations whereupon the prices are dropped to a lower level than that paid by the local creamery.

The process of gradual elimination is carried on in much the same way as the Standard Oil Trust froze out the local refineries one by one until it was left undisputed master of the field and at liberty to dominate the market price.

It is neither good for the farmer nor the butter or cheese manufacturer that competition in the business of buying milk and cream be driven from the field. If a temporary raise in prices results from the operation of the trust it will continue but a short time while the low prices that will ensue as a result of the elimination of competition will continue indefintely.

The danger spoken of is not financial but is real, and immediate. It is absolutely essential to the preservation to the dairy and cheese industries of Wisconsin as they are now carried on that they organize and present an united front against a common enemy that will wipe out both under the existing order of things in a short time.

The Railroads have awakened to the necessity of preserving the local creamery and cheese factory and have issued tariffs removing in a measure at least the discrimintions under which the local factories labored. The advances in rates are being vigorously resented by the centralizers. A restraining order has been issued by the United States Circuit Court in Chicago, prohibiting the advance rates from being prohibited. A petition has been filed with the Interstate Commerce Commission loudly protesting against the proposed advance in rates and the case will be fought with all the vigor that unlimited wealth can command.

The fight involves the life or death of the local creamery and cheese factory in Wisconsin. If the centralizers win the present method of handling milk and cream will, in a few years, be wiped out and the large plants located at a few central points do all the business. The investments in local plants will become a dead loss.

These industries being vitally interested should fight to protect themselves and the communities in which they are located. Twenty-seven firms owning about a hundred factories have been communicated with and are agreed that counsel should be employed and preparations made for a big respite both before the Interstate Commerce Commission and the Wisconsin Commission. Every factory in the state is vitally interested and should join in the movement. Our opponents are well organized and equipped, recognizing that in union there is strength."

Hon. J. Q. Emery, State Dairy and Food Commissioner, is heartily in sympathy with the movement. So is Ex-Gov. W. D. Hoard, and we are informed that the Hon. Secretary of Agriculture believes that the concentrating system is detrimental to the best interests of the farmers.

If you are willing to aid and contribute toward making a fight for your own preservation sign and return the enclosed agreement. Later a meeting will be called and the objects and purposes of the association will be more fully outlined.

The parties in interest who have been already consulted have done considerable work in the way of looking up facts and have retained Mr. John Barnes, former chairman of the Wisconsin Railroad Commission, to represent the dairy and cheese industries of Wisconsin in litigation.

F. A. Seebor, Pres. Wisconsin Dairy Manufgs. and Milk Producers Protective Ass'n.

E. C. Dodge, Lake Mills, Pres. Wisconsin Buttermakers' Assn.

U. S. Baer, Sec'y. Wis. Cheese Makers' Ass'n.

Make all checks payable to the treasurer, Mr. Henry Sorge, and mail to

J. G. Moore,
Secretary,
Madison, Wis.

That this danger to the local cheese factories and creameries of the country is appreciated elsewhere I would say that after presenting this matter to the Minnesota Butter & Cheese Makers' Assocation at its recent convention the following resolution was unanimously adopted.

"Whereas, We beieve that a crisis has arrived in the dairy industry which demands prompt and energetic action on our part, and believing, as we do, that if we have a square deal we can successfully compete with any and all centralizers who may be endeavoring to monopolize the manufacture of butter, and

"Whereas, we beieve that the present low rates enjoyed by the centralizers in the transportation of cream has operated more than anything else to bring about this condition, and

"WHEREAS, this question of discrimination of rates has been brought before the interstate commerce commission for settlement, and

"WHEREAS, the dairy interests of the state of Wisconsin have taken a step in the right direction by employing an attorney to properly present their interests before said commission, therefore be it

"*Resolved,* that we hereby express our hearty sympathy with them in this movement, and pledge them our united support."

The dairy interests of North and South Dakota and Iowa are with us in this fight and are willing to aid in any way possible.

We must go before the Interstate Commerce Commission with all the backing that it is possible to get and we want your moral as well as financial support.

All territory will look alike to our friends the centralizers and you cheese makers and factory men must realize that the hand separator is come to stay and its use is spreading fast and you can not tell how soon your territory will be invaded.

The State Railroad Commission thought this matter of cream rates of so much importance that it took up the matter on its own motion and had a hearing on Nov. 5-6-7. At that hearing largely through the efforts of our Protective Association, through our attorney, Mr. Barnes, a mass of valuable information was presented to the Commission from such witnesses as B. D. White, Asst. Dairyman Dairy Division Dept. of Agriculture, Washington, D. C.; Hon. H. R. Wright, Dairy & Food Commissioner of Iowa; H. J. Credicott, Government Inspector, Chicago, Ill., Hon. J. Q. Emery, Dairy & Food Commissioner, Madison, and members of his staff as well as others. Let me quote from the testimony of Mr. John Kirkpatrick, of Richland Center, as follows:

Q. Where do you reside Mr. Kirkpatrick?
A. Richland Center.
Q. What business are you engaged in?
A. Cheese dealer.
Q. Do you operate any cheese factory?
A. No sir.
Q. Just deal in cheese?
A. Yes sir.
Q. Do you know something about the so-called centralizers?
A. Yes sir, somewhat.

Q. What knowledge have you had in reference to this and in what way have you had your attention called to them?

A. I have visited the plants in Omaha, spoken with some of the employes there, have met their solicitors up in the states.

Q. Now have you paid any attention to the rates on milk and cream in the state of Wisconsin?

A. Not particularly, no sir.

Q. If you have any judgment on the sunbject, Mr. Kirkpatrick, I would like to get the benefit of it, whatever it is, with reference to the probable effect of the centralizing plant upon the cheese industry in Wisconsin, with which you seem to be more intimately connected, I believe.

A. If these centralizing plants can under ordinary values of cheese get into the state I think they will close up half the factories in the state. Where I am in Richland County, solicitors were up there last year and also this spring, but owing to the high values for cheese which has been prevalent for the past two years they could not do very much, but if cheese should get down to a normal basis, say ten cents, I think they could get in and clean us up.

Q. Well, do you think it would be for the best interests of the farming community that that should be done?

A. I think that these establishments are against public policy. I think they are the very worst possible thing that can happen to this state.

Q. Why do you say that?

A. For the reason that I do not believe they make the quality of butter that is now being made in the local creameries. I do not think that it is possible for them to do it.

Q. Any other reason?

A. Well I believe they would do in this state just the same as they have done in other states, after they have practically closed up the local institutions that they will put down this price of cream to such a point that it will be a severe loss to the farming community, that has been their custom.

Q. It is your idea then that they are so equipped that whenever they get around to attend to Wisconsin under existing or prevailing rates they can do so?

A. I think that is true.

Q. Anything else you think of Mr. Kirkpatrick?

A. Nothing except this fact, rates on cheese as compared with the rates on cream. The rates on cheese from Richland Center to Chicago are 42-½ and 8% is to be added for the boxes. I understand they are hauling the cream down to Chicago for practically that rate by express and returning their cans.

Q. You think that this is not fair considering the service that is afforded for the cream and cheese, the value of the two products and everything else, you think that the rate on cheese either is too high or that on cream is too low?

A. The value of a can of cream is practically the value of a 60 pound box of cheese, and one is getting express rates and the other is getting freight rates. One is allowed express service and the other given freight service for the same money."

You will thus see that if Mr. Kirkpatrick is right in his views of the situation that the cheese makers of the state of Wisconsin are intensely interested in this matter rates.

DISCUSSION.

The President: Any questions you would like to ask Mr. Moore?

Mr. F. Marty: Would not the low rates on cream at the present time have a bad influence on the manufacture of cheese? Is that your opinion?

Mr. Moore: I certainly do think so or I would not have had the hardihood to present this paper before the cheesemakers of the state. It seems to me with the spread of the hand separator in localities among cheese factories, if present conditions are to continue, that the centralizers will be putting men in the field and soliciting cream from the very doors of the cheese factories, and with the capital they have behind them they can concentrate their energies on one particular spot until that spot is their own, and that is where the local creamery or cheese factory would have no protection. The only protection is the equalization in rates and I have no fear that the local creamery or cheese factory would be in any danger whatever from any centralizer if the rates are equalized.

Mr. Noyes: The railroad companies are also allowing their agents in some places to take in the cream, weigh it, test it and attend to its shipment, on top of carrying the cream by express for the same rate as they would charge us by freight for our cheese. Where they are starting in they pay the agent a nominal price for this work and he is allowed by the railroads to do it, so you can see how intensified they are on this work. They start out in a small way and very soon are in a big business.

Mr. Larson: Let it not be understood that this cream goes to Chicago by express, but it goes on the express trains at freight rate.

Mr. McCarthy, Minn.: I think this matter is just as important for cheesemakers as for buttermakers. I am in a territory in Minnesota close to the agent; they have a cream agent there that sells hand separators and it cuts in on the cheese makers. I am fighting hand separators as hard as anyone in Minnesota; I would like to see the rates fixed so they would help us a little and I would like to see all the Wisconsin cheese makers take this up because as they are along the railroad here the centralizers are going to cut in on them, and next year if the price of milk goes down hand separators will come in here as they have in Minnesota.

Mr. Dassow: Out our way the hand separators came in and the only thing that saved us was the high price of cheese this year, but if we had a lower price for cheese and a higher price for butter the cheese makers would suffer.

Mr. Schultz: I was down in Missouri and ran a creamery down there. The centralizers came in there and it took them just two weeks to get us out, they were paying four cents more for butter fat than we, so you see what they will do. As Mr. Noyes just said, the railroad agent there was willing to test the cream, pay for it and do all the work at a half cent a pound. That is the way they are doing in some parts of the country. The big fellows that have the money will crowd out the others and I think you will have to fight them in Wisconsin.

Mr. Moore: I wish I could impress you people with the importance of this subject. If you could come in contact with the people who are working in the centralized business you would awaken to the fact that you are up against competition of the keenest kind. The centralizers send their men out to get cream in a locality and they go so far as to threaten the creameries in that locality. Before the State Railroad Commission a buttermaker told that the agent of one of the centralizers came there and wanted to buy his cream, and when he refused to sell, the agent said, "We will shut you up." I wrote to a butter maker up in the Northern part of the state and asked him to come down and give testimony, but he replied that he did not dare for if he told what he knew those fellows would shut him up as sure as fate. You see to what extent they will go. I have a prospectus of one of the large centralizing creameries; they show a map of the United States with a shaded portion, which covers a large portion of the central West, they claim this as their own and say it is growing all the time. I tell, you gentlemen, it is time to wake up.

Mr. Emery: I do not think I can add anything to the discussion except to call attention to the central fact here that this advantage to the centralizer grows out of the fact that his cream is distributed at a lower rate than milk is transported, and if the charge for transportation of that cream compared favoraby with the charge of transportation of milk, or excess baggage or other things, then the creameries and cheese factories would have equal chance for competition, but it is this very unusual transportation charge that puts the creamery man, the cheese man, and their patrons of course, to disadvantage.

Mr Dassow: In regard to the other matter, about the cheese journal, I wish to say I think that is a very good thing and I believe we ought to have a paper of our own; I therefore move that the chair appoint a committee to confer with a committee from the Buttermakers' Association, such committee to consist of Messrs. U. S. Baer, J. B. McCready, and E. G. Schwingel.

Motion duly seconded and carried.

Mr. Corneilson: I would like to ask Mr. Moore how it is proposed to hold the stock, whether it is to be held by the two associations or by the members individually?

Mr. Moore: Mr. President, I would say for Mr. Corneilson's and others information that, so far as I have thought the matter out, the proposition was that the associations should control and own the stock and that the voting power of that stock should be invested in the officers of both associations. If on further consideration, it was found that the associations

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could not furnish enough money to pay up the capital stock, I now feel pretty sure that there are certain men who would be willing to contribute something in the form of money for stock with the idea that the control of it should be still invested in the associations, and if such time ever came that the associations could buy it back and pay for it, they could have it.

The President: If there are no further questions, we will take up the next topic on the program, which is to be handled by Mr. J. W. Moore, the Government expert and Wisconsin exhibition judge, of Madison, Wis.

MONTHLY CHEESE SCORING EXHIBITIONS.

J. W. MOORE, Madison, Wis.

U. S. Department Cheese Expert.

Mr. President, Ladies and Gentlemen and Memebr of the Wisconsin Cheese Makers' Association:

The topic assigned me "Monthly Cheese Scoring Exhibitions" is certainly of importance to everybody interested in dairying, from the producer of milk to the retailer of dairy products. If these Cheese Scoring Exhibitions are conducted as they should be, they are educational and will eventually raise the standard of our make of cheese, thereby, increasing the consumption of cheese per capita which will increase the demand for milk.

I presume it is needless to state the relation that I bear toward our Monthly Cheese Exhibitions. For it is impossible for me to believe that I have gained a prominence among you by doing my work so well that it is not to be criticised by anyone. Yet I am of the opinion that no one before me has been able to accomplish this end, and he who is able to accomplish it, is superhuman.

In order to become an efficient judge of cheese in an educational exhibition, a person must set up some definite standard in his own mind, as to what a number one cheese is. I know of no better way to determine this standard than by selecting the very best milk obtainable, make it into cheese according to the best methods and cure same properly. When this has been accomplished we will have a product, which we can use as a standard.

At the present time a cheese scoring as much as 92 points is classified as extras. If a cheese scores a certain number of points below extras, we should be able to attribute it to a certain fractional part of the market price of cheese.

The score card now used in Wisconsin is as follows: Flavor 45 points, Texture 30, Color 15, and Make-up 10. Now some of us hold that salt should be given a place on our score card and others contend that it should not. I believe that salt does not need a place on a score card, especially where we write out our criticisms, for when we have scored a cheese for flavor and texture we have already considered salt. Salt as used in cheese making does not give a salty flavor but just merely adds to the flavor. A cheese which has less salt than it should have is lacking in flavor. It may also be moist, weak and even pasty, due to the lack of salt. On the other hand too much salt gives a slow curing cheese, low in flavor and a harsh stiff or even corky texture.

The Wisconsin Cheese Scoring Exhibitions were started a year ago last May, principally under the auspices of the Dairy and Food Commission. This proved to be of great help to the cheese interests of the State and the following May the University Dairy School made these Cheese Exhibitions a branch of their Department.

To illustrate how the exhibitors have been strengthened, I wish to cite the results obtained at our last State Fair. The number of cheese received from those taking part in the Monthly Cheese Exhibitions and outsiders were about equal, sixty-six per cent of the prize money offered for cheese was won by exhibitors taking in these Exhibitions, also winning the first prize on Cheddars, Flats, Daisies and Prints.

The principal improvement in flavor since the starting of these exhibitions seems to be the doing away of high acid cheese. For at first we found many high acid cheese, while now they are very scarce. The texture runs much more uniform now than at first. The makeup of the cheese has improved very materially and there certainly was ample room for improvement in this, for some of us.

Holding the cheese one month in the Dairy School Curing rooms is a splendid plan as it gives everybody's cheese an equal opportunity for curing and at the same time tends to make certain the reseipt of cheese more nearly representing the output of the factories represented in these Exhibitions.

DISCUSSION.

Mr. Haven, Mich.: What per cent of the factories in Wisconsin take part in these scoring contests?

Mr. Moore: I think Mr. Michels told us this forenoon in his paper that something like 300 participated in this exhibition the past season, about one-fifth of the cheese makers in the state.

Mr. Parkin, Minn.: How old was the cheese when you received it?

Mr. Moore: Most of it quite green, four or five days old, right from the press to the box. Most of it by the time we got it paraffined was from a week to ten days old.

Mr. McCarthy: Was the cheese paraffined as soon as you received it?

Mr. Moore: Yes, as soon as the cheese was received it was paraffined.

Mr. Dassow: Mr. McCready told us this morning that paraffined cheese lacked flavor. How did your cheese come out?

Mr. Moore: Of course we did not have duplicates of those cheese so we are not able to state. I do agree with Mr. McCready that there is a serious objection to paraffining cheese green and I think that as long as cheese is marketed as it is today, very close to the make, I think dealers should be strict and reject any cheese paraffined at the factory. I have spent some time among dealers and have found cheese damaged by being paraffined in the factory and I have also found much cheese damaged in the car. Some of the railroad agents are very careless in having cheese piled up and if the cheese makers do not insist upon the cheese being piled as they should be, they are stacked in one end of the car and when the cars are moved they are thrown all over the car. Cheese treated in that way cannot be gotten into market in the best shape, even though the dealers strip the paraffine off and re-paraffine it again it will not look as good as before.

Mr. Emery: For my own information, I want to ask is it maintained by you and by Mr. McCready this morning that cheese should not be paraffined at all, or that cheese should not be paraffined at the factory.

Mr. Moore: Under present conditions the way cheese is marketed now (it is not marketed as it should be) but as it is marketed now very close to the hoop, I think cheese dealers should stand firm in that and not take cheese that is paraffined at the factory. I do not see any objection to the dealer paraffining it.

Mr. De Land: Mr. President, I have always done as much paraffining of cheese as any dealer. I claim to be the first man in the state to do any paraffining, did it in a primitive way with a kettle over an other kettle to heat water. I have also experimented with cheese paraffined and unparaffined and put in cold storage both ways, I have tested both. As to the flavor of the cheese being better or worse by being paraffined, it is not true. The chemical change takes place just as well with the paraffine coat, and the shrinkage is much less. I am willing that the cheese should be paraffined as soon as the bandage is dry. The objection to having the factory men paraffine the cheese is that they do not get it hot enough, do not take pains in dipping the cheese and will get on all the paraffine they can, and the result is that when that is put into the car it generally breaks the paraffine.. We who understand it, put on the lightest coat of paraffine possible and it is not so apt to break up.

If you want to ask any questions of me regarding paraffining I am ready to answer them. They make a wax that tests 123 to 125 so of course it has less water and is more elastic than this cheese wax.

Mr. Emery: The paraffining of cheese does not deteriorate in any way the quality of the cheese?

Mr. DeLand: It does not, for I have tested it in my cold storage. I did it to not only determine the effect on the quality but as to the shrinkage.

Mr. F. Marty: I would like to ask Mr. Moore if he has ever carried on any experiments with duplicate cheese for a certain period, one paraffined and the other unparaffined, a score being taken at the time of putting the cheese in storage and another score taken when the cheese came out?

Mr. Moore: I have not done any work along that line directly but the work we have done has helped to confirm some ideas along that line. Last year the government had forty-five different lots of cheese in storage at Plymouth and we could see some difference in the cheese that was paraffined and put in cold rooms right from the hoop; we had other cheese that was held in an ordinary curing room from the same lot, then paraffined and put in a cold room at a temperature of 38 or 40.

Mr. Aderhold: If there was any difference in the texture you could not lay it to the paraffining?

Mr. Moore: What I meant to bring out was there was a difference in the pastiness. We naturally think that the one held in the ordinary curing room two weeks dried out more tha the one immediately put in cold storage. There would be more moisture in the former cheese and it would be rather pasty.

Mr. F. Marty: I would like to ask what is the average per cent. of moisture that is expelled from a cheese not paraffined? That is a 100 lb. cheese unparaffined, put away for any length of time, what per cent of moisture will be expelled from it, and how much from the same cheese if unparaffined?

Mr. Moore: I do not know anything about that; in fact I have not tested the moisture contained in the cheese this last summer at all. I do not think we have a man in the state who has tested more moisture in cheese this year than President Michels, and perhaps he will give you his opinion.

President Michels: We have a few figures on that but I have not them here but perhaps next year I can give you a good many figures on the moisture in cheese. We have tested every cheese sent to the dairy school this year, held at different temperatures, paraffined and unparaffined, and when we meet again in convention I think there will be many things we will know about moisture that we do not know today. We find moisture in cheese runs all the way from 33 to 45%.

Mr. F. Marty: About what per cent of moisture would naturally evaporate from a cheese not paraffined? What per cent is expelled from that cheese during the curing process?

The President: I think Mr. DeLand can answer that question.

Mr. DeLand: Take a box of Twins put in in May and brought out in September or October, and I usually found about two pounds loss on the box. On a 65 lb. cheese the average shrinkage, if unparaffined would be about 2 lbs., while if paraffined we have not had any that would shrink a half pound in that time. Practically the texture of paraffined cheese is better than the one that is unparaffined. The reason for that is this,—the two pounds that is left in the box of Twins is water, and that water helps to make the texture a lot smoother than the cheese that is dried out. The unparaffined cheese will dry out.

Mr. Enright: A cheese that will expel moisture, will break paraffine but cheese thoroughly cured will not expel moisture.

Mr. Noyes: I just want to bring the fact up that the temperature of the room in which cheese is cured makes a lot of difference in the evaporation and shrinkage of the cheese. We had factories with the old fashioned way of curing up stairs and it became very noticeable how much more moisture we lost then in six weeks than we do now in the same time. We do not want to lose sight of that fact.

Mr. Moore: I would like to ask Mr. DeLand what moisture content the cheese has where the texture will not be effected by holding all the moisture in it. As I understood him, the cheese that is paraffined will retain two pounds more moisture than the one that is not paraffined. If you have made that so it will cure up just right by losing that two pounds moisture, the one that still retains the two pounds of moisture will probably be pasty and have excess moisture, cure faster than it should.

Mr. DeLand: I do not think so. I have never found cheese that came out with a firm texture that got pasty after putting it in storage.

Mr. Moore: Are they all firm texture?

Mr. DeLand: We have a good many pasty cheese in the fall of the year and at this time but we get rid of them as soon as we can. We do not carry pasty cheese.

Mr. Aderhold: This evaporation of water does not take place from every portion of that cheese. The water leaves the outside and does not come from the very center of the cheese. If that cheese is pasty to start with it will be pasty in the center while the surface will be too dry to be good eating cheese. I am referring to unparaffined cheese. I have seen cheese where one would have to cut away a half inch around the surafce in order to get where there was anything fit to eat, the water had evaporated so from the surface.

Mr. DeHaan: I would like to know if this scoring contest up in Wisconsin is open for the world, or is it for Wisconsin alone?

The Chairman: It is just for Wisconsin.

Mr. DeHaan: I have been sending cheese here and I am from Iowa.

The President: So far we have had but one man from outside the state and he was from Illinois. I suppose that outsiders will get in and some arrangement will have to be made. This is a branch of the University work in the course of agriculture and other courses down there, and non-residents have to pay a certain fee. It is a state institution supported by the state and there would probably be a larger difference if outsiders came in.

Mr. Wallace: Don't you think the scoring at this educational school contest is done too high? Is not the general average high, Mr. Moore?

Mr. Moore: I do not know that my opinion on that subject amounts to any more than that of any one else.

Mr. Wallace: Did you ever compare the high scores obtained by certain exhibitors in the state of Wisconsin and have those exhibitors go to the Minnesota state fair or any other state fair and go down two or three points? A Minnesota man will come here and exhibit and get a score two or three points lower than he had obtained at home. I would like to have you explain why they cannot get the same score in other states as in their home state?

The President: There is no man in the world today that can score two or three hundred tubs of butter or boxes of cheese and have them all come within a half point. Last summer we had a letter from one man in particular saying he had a tub of butter at the Minnesota state fair that scored a point and a half higher than at our state fair, and they were out of the same churning. We had another man that got a score on cheese in Chicago two points higher than the one at Madison and he complained of our score. When we score higher than the other states we hear nothing about it.

Mr. Wallace: I have noticed in the papers the reports of the scores on cheese more than on butter, and I have noticed that the men who scored high here were nowhere near being high in Minnesota, and even Michigan will score higher than we do on cheese and we thought Michigan was not in it as a fine cheese state, but I have come to the conclusion that all those scoring contests are merely to advertise each particular state regardless of quality.

Mr. Corneilson: Is it not a fact that cheese that may be considered first class in St. Paul may not be considered first quality in Milwaukee? Different cities have different ideas of cheese, and I think that reason may account for the fact of cheese from Sheboygan or Plymouth not scoring as high in St. Paul as down here and vice versa.

Mr. DeLand: In answer to this inquiry, I would say that Wisconsin, Sheboygan County, has exhibited at every national exhibition of cheese. Now then, if those scores varied very much from the regular contest then it would look as though there was something to advertise the state but I assure you that the same men who exhibited at St. Louis, Buffalo and Chicago had scores practically or about the same as the contest in this state has shown. I think that should answer the question.

Mr. Wallace: That is true about St. Louis, but show me some that got a high score in Minnesota and got it here.

Mr. Kasper: Last summer I had some cheese in Minnesota and here and my cheese scored within two tenths of a point as high in Minnesota as it did in Wisconsin.

Mr. Aderhold: That does not decide the matter; your cheese simply has that habit, that is all.

Mr. Enright: Would it make any difference, if the cheese were scored on the same points, whether it was high or low and have it uniform?

Mr. Baer: I cannot agree with Mr. Wallace in his statements. Minnesota not long ago did me the honor of asking me to judge some sixty or seventy cheese at the Minnesota state fair, and among them were about thirty-five or forty cheese from Wisconsin. I was the sole judge and Minnesota got first on Young Americas, first on Swiss, first on Limburger and second on Brick. I knew nothing about whose cheese I was scoring, whether it came from Wisconsin or Minnesota.

The President: Mr. Parkin, who has charge of the scoring of cheese in Minnesota, is here and we would like to hear from him on this subject.

Mr. Parkin: We do not go after the soft cheese quite as hard as you do in Wisconsin, our market there caters a little to soft cheese. We do not want anything spongy or loose, but I think you score a little heavier on pastiness than we do.

Mr. Wallace: Do you think an educational contest ought to offer prizes? Do you think it is a true reward of merit for the work done? Is it not possible that the man that is doing the most to improve conditions may not be the man that is making the cheese? So don't you think it a detriment in an educational contest for a man to offer a prize of any kind?

The President: Scoring contests in this state do not offer a prize of any kind. We have no prizes to offer at all; the prizes given are offered by individuals.

Mr. Haven: Are the cheese sent to the scoring contest and held thirty days before being scored?

The President: They are held thirty days, then scored and sold.

Mr. Anderson: I want to ask a question of Mr. Moore in regard to scale of points in scoring. Did you not say you gave 45 points to flavor and 15 to color? Does that not give the flavor three times as much influence on the total score as the color?

Mr. Moore: It seems to me a reasonable cause for giving 45 points on a scale of 100 is because flavor is the most important.

Mr. Anderson: If one man loses one point on flavor and the other man lose one point on color, they would both get

99, would they not? Each would then have the same influence.

Mr. Moore: We will say that a cheese scores under extras, which is 92. It does not matter whether that is cut down in flavor, texture, color and make, or whether it is almost all based on one defect or a little of each, but I think that that should be attributed to a fractional part of the market price of cheese. I was formerly of the opinion that we gave flavor 45 points because it was the most important, that we gave texture 30 because it came next, and I thought that three points cut in body was equivalent to two points in flavor, but I think now that is wrong.

The President: In other words we give flavor 45 as perfect because it is so much more apt to vary than the makeup. If you only gave it ten you might want to cut it fifteen and could only cut ten.

Mr. Dassow: If you cut a cheese one point on flavor and also one point on color, what sort of cheese would it be?

Mr. Moore: It would be a bad looking cheese. A cheese that would deserve one point on color, you would naturally look to have defects in flavor or texture; or if it deserves a cut of one out of fifteen on color you would not expect to find either the texture or flavor very fine.

The President: I believe we will have to close this discussion as it is getting late. We wlll now be favored by a song by Mrs. Kempfer.

Solo sung in the Swiss language by Mrs. Kempfer, of Winneconne which was much enjoyed by the audience and an encore given.

The Chairman: The next will be the reading of scores by our secretary, Mr. Baer.

REPORTS OF EDUCATIONAL CHEESE SCORING EXHIBITIONS.

U. S. BAER, Madison, Wis.

AMERICAN CHEESE.

Name	Address	Score
Joseph Bergs	Edgar, Wis.	95.25
Anton Benishek	Kellnersville, Wis.	96.83
Chas. Beeman	Viola, Wis.	94.91
L. J. Blahnik	Kewaunee, Wis.	95.33
A. A. Cross	Mauston, Wis.	93.00
P. E. Cranston	Soldiers Grove, Wis.	95.25
Matthew De Haan	Lineville, Iowa	93.16
M. G. Douma	Cleveland, Wis.	94.33
W. D. Fecker	Kiel, Wis.	93.83
J. A. Fuller	Lancaster, Wis.	95.33
John Fisher	Boaz, Wis.	93.75
M. J. Gregorius	Appleton, Wis.	95.00
Arnold Grimm	Fremont, Wis.	95.16
B. Griese	Black Creek, Wis.	95.25
O. F. Greunke	Clintonville, Wis.	95.33
F. J. Harder	Hilbert, Wis.	95.00
W. B. Hatch	West Bend, Wis.	94.00
John Hoeppner	Marion, Wis.	97.00
Frank Haack	Casco, Wis.	84.33
Emil Hos'g	Mayville, Minn.	92.18
F. E. Hannaweel	Mt. Horeb, Wis.	95.33
U. L. Johnson	Fairwater, Wis.	90.50
N. Jennings	Readstown, Wis.	94.33
A. G. Koopman	Pt. Washington, Wis.	94.33
L. Kohlmann	St. Cloud, Wis.	90.91
J. J. Kuhn	Cleveland, Wis.	93.83
Oscar Knudson	Montfort, Wis.	94.66
Geo. J. Kust	Neillsville, Wis.	95.50
P. H. Kasper	Welcome, Wis.	95.16
E. Kopping	Sawyer, Wis.	95.33
Wm. Kuehl	Kewaunee, Wis.	96.00
Jas. Lord	Ithaca, Wis.	95.00
E. B. Mayhew	Greenbush, Wis.	93.16
Ed. Maedke	Stanley, Wis.	94.50
Math. Meyer	New Holstein, Wis.	95.00
Anton Mueller	Hayton, Wis.	92.50
R. A. Murray	Yuba, Wis.	96.50
J. A. Newell	Merrill, Wis.	91.83
L. Novotny	Grimms, Wis.	94.83
H. L. Noyes	Muscoda, Wis.	95.75
Chas. H. Patt	Van Dyne, Wis.	94.25
H. F. Pieper	Eden, Wis.	93.58
A. F. Peterson	Appleton, Wis.	95.16
H. W. Priebe	Kewaunee, Wis.	95.33
W. L. Parkin	Northfield, Minn.	89.50
N. L. Ropp	S. Kaukauna, Wis.	96.16
L. O. Rehm	Elkhart, Wis.	92.41
Chas. Rasmussen	Clintonville, Wis.	97.16
T. W. Schreiber	Kiel, Wis.	94.33

A J. Schulte	Hilbert, Wis.	94.41
E. G. Schwingel	Avoca, Wis.	94.58
Alb. Schauf	Neptune, Wis.	95.83
E. S. Snyder	Bloom City, Wis.	93.50
G. Steinhart	Kewaunee, Wis.	94.83
J. J. Srockker	Dale, Wis.	94.50
H. M. Scott	Waldo, Wis.	93.08
T. A. Ubbelohde	Glenbeulah, Wis.	96.08
H. Verhulst	Oostburg, Wis.	94.83
John Vogt	Fremont, Wis.	97.08
Pat. Wallace	Hortonville, Wis.	95.50
Wm. Waddell	Hub City, Wis.	95.66
W. Zlab	Two Rivers, Wis.	93.66
P. Zehren	Marion, Wis.	97.66
J. L. Zehren	Marion, Wis.	97.33

SWISS CHEESE.

Name	Address	Score
Jos. Ackerman	Monroe, Wis.	96.00
J. R. Beddulph	Tiskiwa, Ill.	93.50
Jacob Hefty	Mt. Horeb, Wis.	96.87
Jacob Karlen	Monroe, Wis.	95.00
Jacob Karlen & Son	Monroe, Wis.	95.50
Alex Lisser	Darlington, Wis.	94.00
Jacob Marty	Brodhead, Wis.	97.50
Henry Meyer	Darlington, Wis.	94.00
Ernest Regez	Blanchardville, Wis.	95.25
Ernest Regez & Son	Blanchardville, Wis.	96.50
John Roethlisberger	Juda, Wis.	98.12
Herman Schoefer	Hollandale, Wis.	94.25
Fred Schenskel	Calomine, Wis.	94.25
Jac. Schurtter	Argyle, Wis.	95.25
Frank Scheurman	Belmont, Wis.	91.75
Rudolph Urben	Ridgeway, Wis.	90.00
Louis Urfer	Monroe, Wis.	93.00
Gott. Vogel	Mt. Horeb, Wis.	95.25
John Wehinger	Woodford, Wis.	90.00
Joe Huber	Wis.	96.87

BRICK CHEESE.

Name	Address	Score
C Anderegg	La Crosse, Wis.	98.00
Chris Bigler	Clayton, Wis.	92.00
C. F. Brinkman	Coon Valley, Wis.	94.62
Reinhard Boenfeldt	Burnett Jct., Wis.	91.75
J. W. Falk	Mayville, Wis.	92.00
Henry Hoseley	Turtle Lake, Wis.	91.75
Louis Hasse	Juneau, Wis.	95.50
Oscar Kramer	La Crosse, Wis.	94.50
Chris Kohli	Mayville, Wis.	96.62
Jac. Karlen	Monroe, Wis.	95.25
G. Muhleisen	Alma, Wis.	96.25
G. L. Rendler	Coon Valley, Wis.	94.75
E. Regez, Sr	Blanchardville, Wis.	97.25
E. Regez, Jr	Blanchardville, Wis.	96.75
J. Rothenbach, Jr	Ackerville, Wis.	94.50
Carl Schmidt	Oconomowoc, Wis.	92.75
Alex Schaller	Barneveld, Wis.	96.25

LIMBURGER CHEESE.

Name	Address	Score
John Altman	Mineral Pt., Wis.	95.00
Jacob Karlen & Son	Monroe, Wis.	95.75
Ernest Regez, Jr.	Blanchardville, Wis.	98.75
Ernest Regez, Sr.	Blanchardville, Wis.	97.00
Jacob Senn	Belleville, Wis.	96.75
Otto Sommer	Cedarburg, Wis.	92.75
Henry Zweifel	Warren, Ill.	96.25
Unknown		96.50

CONVENTION CHEESE SCORES.

The following is a complete list of the exhibitors of all styles of cheese at the Wisconsin Cheese Makers' Sixteenth Annual Convention, held in Milwaukee, January 8, 9 and 10, 1908, having a score of 90 or above.

AMERICAN CHEESE.

Name	Address	Flavor	Texture	Color	Make-up	Score
Joseph Bergs	Edgar, Wis.	42.00	28.16	15.00	9.41	95.58
A. Benishek	Kellnersville, Wis.	42.83	29.00	15.00	10.00	96.83
Joseph Bergs	Edgar, Wis.	42.00	27.00	14.83	9.83	93.66
Chas. Beeman	Viola, Wis.	42.16	28.16	15.00	9.91	94.91
J. R. Biddulph	Tiskilwa, Ill.	42.16	26.33	15.00	15.00	93.50
L. J. Blahnik	Kewaunee, Wis.	42.50	27.83	15.00	10.00	95.33
A. A. Cross	Mauston, Wis.	41.66	26.83	15.00	9.83	93.00
P. E. Cranston,	Soldiers Grove, Wis.	42.16	28.16	15.00	9.91	95.25
M. DeHaan	Lineville, Ia.	41.50	27.16	15.00	9.50	93.16
M. DeHaan	Lineville, Ia.	40.33	26.66	15.00	9.83	91.50
M. G. Douma	Cleveland, Wis.	41.33	28.00	15.00	10.00	94.33
W. D. Fecker	Kiel, Wis.	42.16	27.66	15.00	9.00	93.83
J. A. Fuller	Lancaster, Wis.	42.00	28.33	15.00	10.00	95.33
John Fischer	Boaz, Wis.	42.00	26.83	15.00	9.91	93.75
W. D. Fecker	Kiel, Wis.	41.83	27.50	15.00	9.16	93.50
M. J. Gregorius	Appleton, Wis.	42.50	27.50	15.00	10.00	95.00
Arnold Grimm	Fremont, Wis.	42.16	28.16	15.00	9.83	95.16
B. Griese	Black Creek, Wis.	42.50	28.16	15.00	9.58	95.25
O. F. Greunke	Clintonville, Wis.	42.16	28.33	14.83	10.00	95.33
F. J. Harder	Hilbert, Wis.	42.83	27.16	15.00	10.00	95.00
W B. Hatch	West Bend, Wis.	41.66	27.50	15.00	9.83	94.00
John Hoeppner	Marion, Wis.	42.83	29.16	15.00	10.00	97.00
Frank Hosig	Mayville, Minn.	41.66	26.16	15.00	9.25	92.18
F. E. Hannawell	Livingston, Wis.	42.50	27.83	15.00	10.00	95.33
U. L. Johnson	Fairwater, Wis.	40.33	29.16	15.00	9.33	90.50
N. Jennings	Readstown, Wis.	41.83	27.50	15.00	10.00	94.33
A. C. Koopman,	Pt. Washington, Wis.	41.00	28.33	15.00	10.00	94.33
L. H. Kohlman	St. Cloud, Wis.	38.83	27.50	15.00	9.58	90.91
J. J. Kuhn	Cleveland, Wis.	42.33	26.83	15.00	9.66	93.83
Oscar Knudson	Montfort, Wis.	42.16	27.50	15.00	10.00	94.66
Geo. J. Kust	Neillsville, Wis.	42.66	28.00	15.00	9.83	95.50
P. H. Kasper	Welcome, Wis.	42.50	28.66	15.00	10.00	96.16
E. Kipping	Sawyer, Wis.	42.50	27.83	15.00	10.00	95.33

Name	Address	Flavor	Texture	Color	Make-up	Score
William Kuehl	Kewaunee, Wis.	42.66	28.33	15.00	10.00	96.80
James Lord	Ithaca, Wis.	42.33	27.66	15.00	10.00	95.00
E. B. Mayhew	Greenbush, Wis.	40.66	27.83	15.00	9.66	93.16
Ed. Maedke	Stanley, Wis.	42.00	27.83	15.00	9.66	94.50
Math. Meyer	New Holstein, Wis.	42.66	27.50	14.83	10.00	95.00
Anton Mueller	Hayton, Wis.	42.00	27.33	15.00	8.16	92.50
Math. Meyer	New Holstein, Wis.	42.16	27.50	15.00	10.00	94.66
R. A. Murray	Yuba, Wis.	43.33	28.16	15.00	10.00	96.50
J. A. Newell	Merrill, Wis.	41.00	26.50	14.93	9.50	91.83
Louis Novotny	Grimms, Wis.	43.16	27.83	15.00	9.83	94.83
H. L. Noyes	Muscoda, Wis.	43.16	28.66	15.00	9.91	95.75
Chas. H. Patt	Vandyne, Wis.	42.16	27.16	15.00	9.91	94.25
H. F. Pieper	Eden, Wis.	41.50	27.16	15.00	9.91	93.58
A. F. Peterson	Appleton, Wis.	41.83	28.83	15.00	9.50	95.16
H. W. Priebe	Kewaunee, Wis.	42.33	28.00	15.00	10.00	95.33
W. L. Ropp	Wrightstown, Wis.	42.50	28.33	15.00	10.00	96.16
L. O. Rehm	Elkhart, Wis.	40.83	27.16	14.83	9.91	92.41
Chas. Rasmussen	Clintonville, Wis.	43.00	29.16	15.00	10.00	97.16
T. W. Schreiber	Kiel, Wis.	41.50	27.83	15.00	10.00	94.33
A. J. Schulte	Hilbert, Wis.	42.16	27.33	15.00	9.91	94.41
E. G. Schwingel	Avoca, Wis.	41.83	28.00	15.00	9.75	94.58
Albert Schauf	Neptune, Wis.	42.50	28.33	15.00	10.00	95.83
E. S. Snyder	Bloom City, Wis.	41.66	26.83	15.00	10.00	93.50
G. Steinhart	Kewahnee, Wis.	42.50	27.50	14.83	10.00	94.83
J. J. Stockker	Dale, Wis.	42.33	27.33	15.00	9.83	94.50
H. M. Scott	Waldo, Wis.	41.83	27.16	15.00	9.08	93.08
T. A. Ubbelohde	Glenbeulah, Wis.	42.66	28.66	15.00	9.75	96.08
H. Verhulst	Oostburg, Wis.	42.66	27.16	15.00	10.00	94.83
John Vogt	Fremont, Wis.	42.83	29.33	15.00	9.91	·97.08
Pat Wallace	Hortonville, Wis.	42.33	28.66	15.00	9.50	95.50
William Waddell	Hub City, Wis.	42.66	28.16	15.00	9.83	95.66
Wenzel Zlab	Two Rivers, Wis.	41.33	27.70	15.00	9.83	93.66
Peter Zehren	Marion, Wis.	43.50	29.16	15.00	10.00	97.66
J. L. Zehren	Marion, Wis.	43.00	29.33	15.00	10.00	97.33

SWISS CHEESE.

Name	Address	Flavor	Texture	Color	Salt	Make-up	Score
Jos. Ackerman	Monroe, Wis.	33.75	29.00	18.75	9.50	5.00	96.00
J. Hefty	Mt. Horeb, Wis.	34.00	26.50	19.50	10.00	5.00	95.00
J. Huber	Monroe, Wis.	33.75	29.87	19.25	9.00	5.00	95.87
J. Karlen	Monroe, Wis.	33.00	27.75	19.50	9.75	5.00	95.00
J. Karlen & Son	Monroe, Wis.	33.25	29.25	19.25	9.00	4.75	95.50
A. Lisser	Darlington, Wis.	33.50	27.00	18.75	10.00	4.75	94.00
J. Marty	Brodhead, Wis.	33.00	29.50	20.00	10.00	5.00	97.50
H. Meyer	Darlington, Wis.	33.50	27.25	19.25	9.75	4.75	94.00
E. Regez	Blanchardville, Wis.	33.25	29.00	19.25	9.00	4.75	95.25
E. Regez & Son	Blanchardville, Wis.	33.25	28.25	20.00	10.00	5.00	96.50
J. Rothlisberger	Juda, Wis.	33.12	30.00	20.00	10.00	5.00	98.12
H. Schoepfer	Hollandale, Wis.	32.75	30.00	17.00	9.50	5.00	94.25
F. Schenkel	Calomine, Wis.	33.25	27.25	19.50	9.75	5.00	94.25
J. Schurtter	Argyle, Wis.	33.50	29.00	18.50	9.25	5.00	95.25
F. Scheurman	Belmont, Wis.	32.00	27.00	18.25	9.50	5.00	91.75
R. Urben	Ridgeway, Wis.	32.50	26.50	18.75	9.75	4.50	90.00
L. Urfer	Monroe, Wis.	33.25	26.25	18.75	9.75	5.00	93.00
G. Vogel	Mt. Horeb, Wis.	33.25	28.25	19.25	10.00	4.50	95.25
J. Wehinger	Woodford, Wis.	34.00	30.00	20.00	10.00	5.00	99.00

BRICK CHEESE.

Name	Address	Flavor	Texture	Color	Salt	Make-up	Score
C. Anderegg,	La Crosse, Wis.	38.75	39.25	10.00	5.00	5.00	98.00
C. Bigler	Clayton, Wis.	38.00	34.00	10.00	5.00	5.00	92.00
C. Brinkman,	Coon Valley, Wis.	37.25	37.50	10.00	5.00	4.87	94.62
R. Boenfeldt,	Burnett Jct., Wis.	37.25	34.75	9.75	5.00	5.00	91.75
J. W. Falk	Mayville, Wis.	36.75	36.00	9.50	5.00	4.75	92.00
H. Hoseley,	Turtle Lake, Wis.	35.50	36.50	10.00	5.00	4.75	91.75
L. Hasse	Juneau, Wis.	37.50	38.25	9.75	5.00	5.00	95.50
O. Kramer	La Crosse, Wis.	36.75	37.75	10.00	5.00	5.00	94.50
J. Karlen	Monroe, Wis.	37.25	38.00	10.00	5.00	5.00	95.25
C. Kohli	Mayville, Wis.	38.50	38.12	10.00	5.00	5.00	92.62
C. Kohli	Mayville, Wis.	37.00	36.50	10.00	5.00	5.00	93.50
G. Muhleisen	Alma, Wis.	37.12	39.00	10.00	5.00	5.00	96.25
G. L. Rendler,	Coon Valley, Wis.	37.00	37.75	10.00	5.00	5.00	94.75
E. Regez, Sr.,	Blanchardville, Wis.	38.75	38.50	10.00	5.00	5.00	97.25
E. Regez, Jr.,	Blanchardville, Wis.	38.25	38.50	10.00	5.00	5.00	96.75
J. Rothenbach, Jr.,	Ackerville, Wis.	37.50	37.00	10.00	5.00	5.00	94.50
C. Schmidt,	Oconomowoc, Wis.	37.50	35.75	10.00	5.00	4.50	92.75
A. Schaller,	Barneveld, Wis.	38.00	38.25	10.00	5.00	5.00	96.25

LIMBURGER CHEESE.

Name	Address	Flavor	Texture	Color	Salt	Make-up	Score
J. Altman,	Mineral Pt., Wis.	37.50	38.50	10.00	5.00	4.00	95.00
J. Karlen & Son,	Monroe, Wis.	38.75	37.00	10.00	5.00	5.00	95.75
E. Regez, Jr.,	Blanchardville, Wis.	39.12	39.50	10.00	5.00	5.00	98.75
E. Regez, Sr.,	Blanchardville, Wis.	38.50	38.50	10.00	5.00	5.00	97.00
J. Senn	Belleville, Wis.	38.00	38.75	10.00	5.00	5.00	96.75
H. Zweifel	Warren, Ill.	37.12	39.00	10.00	5.00	5.00	96.25
Unknown	Unknown	38.00	38.50	10.00	5.00	5.00	96.50

The $100.00 cash premium fund will be awarded on the excess pro rata plan to all entries scoring 92 points and above.

Every exhibitor whose cheese scores 90 points and above will receive a diploma signed by the judges, and verified by the president and secretary, setting forth the score of the cheese, the highest score, the lowest score, and the average score of all cheese exhibited at the meeting.

Respectfully submitted,
J. W. CROSS. Mauston, Wis.
Superintendent.

Judges:
Math. Michels, Madison, Wis.
J. D. Cannon, New London, Wis.
J. W. Moore, Madison, Wis.
Gottlieb Marty, Madison, Wis.

The President: The next will be the awarding of premiums by Hon. J. Q. Emery, our State Dairy and Food Commissioner.

AWARDING OF SPECIAL PRIZES, DIPLOMAS AND PRO-RATA PREMIUM FUND.

Hon. J. Q. Emery, Madison, Wis.

Dairy and Food Commissioner.

Mr. President, Ladies and Gentlemen:

I want to give a little credit to myself in the way of prophecy. Those of you who were here a year ago will recall, I think, that at the close of the awarding if special prizes in the room at the hotel, when that room was full to overflowing, many people standing, I said that I thought the association had outgrown the capacity of that room and it seemed to be up to the officers of the association to find a larger place for its meeting if the association were to grow from that time on. The larger room has been provided and this afternoon it is filled, so I think in one respect I may claim a little of the spirit of prophecy.

Something has been said here this afternoon in regard to the matter of prizes. Life is a struggle for prizes. We are all seeking those prizes, some gaining more, others less. Now the prizes that are awarded are, as I understand it, for the purpose of stimulating an interest, inducing people to participate in these scoring contests that might not otherwise do so, to awaken interest, and as such they have great value. Now in the educational scoring contest that is being carried on by the dairy school, beginning last year, there are three men assigned to the work of judges. They are experts and if they are not the best men in the state they are certainly equal to any in the state in the matter of scoring cheese. These men come together and pass individual judgment upon the cheese, probably arrive at about as accurate conclusion as can be expected of human nature. At a meeting of the Minnesota Butter and Cheesemakers Association, a few weeks ago, there was a scoring contest for the scorers of butter. The experts who score butter were called upon to pass judgment at different times on the same tubs of butter. They did not score it twice alike in a great many cases but they came so near it that I have had my confidence greatly strengthened in the accuracy of these scoring contests. "Wisconsin's progress in the dairying industry has been studied throughout Europe," said Sir Horace Plunkett, member of the British Parliament from Ireland, in an address to 300 agricultural and dairy students at the University of Wisconsin.

Fifty-seven million dollars of annual revenue from all classes of dairy products, including by-products from cheese factories and creameries, 102,000 patrons, 944,000 cows contributing more than 3,166,000,000 lbs. of milk annually to 2,925 cheese factories, creameries and skimming stations, factories and machinery approximating $5,000,000 in value—such are the figures that give a somewhat inadequate notion of Wisconsin conditions as to the extent of her dairy industry. First, in the number of cheese factories, first in the number of creameries; first in the combined number of cheese factories and creameries, first in the total aggregate for butter and its by-products; second only to the Empire state in the total aggregate for cheese and its by-products; second only to the same state in the total aggregate for all dairy products, including by-products, with Iowa as third, Illinois as fourth, Minnesota as fifth and Pennsylvania as sixth, exceeding the combined total aggregate of all dairy products and by-products of Iowa and Minnesota by more than $2,000,000 and of Illinois and Pennsylvania by more than $5,000,000—such is the *rank* of Wisconsin among the great dairy states of the Union as shown by the United States census of manufacturers for 1905. Cheese that commands the highest prices in the best cheese markets of the world, creamery butter whose percentage of "extras" is not exceeded by any state and which returns to Wisconsin patrons a net price equal to, if not exceeding, that of any other state—such is the *quality* of Wisconsin commercial butter and cheese.

The beautiful Rock River Valley, undulated by hills and valleys, abounding in crystal waters, with a pure atmosphere rightly tempered by winter snows and summer rains, a conspicuous part of the original as it now is of the greatly extended Elgin creamery butter district, far-famed for the superior quality of its creamery butter; a deep rich soil supplied with purest water, yielding abundant, luxuriant grasses, along the eastern portion of the state bordering on Lake Michigan that gives to the climate an evenness of temperature and a degree of moisture peculiarly conducive to high quality in cheese, and like conditions extending over central and northern Wisconsin—these are some of the conditions which nature has contributed to the results above indicated. Wisconsin's great variety of soils with the presence of her varied hills and valleys, combined with her geographical location, were the tempting causes that brought within her borders dairymen from the East and sturdy, industrious and frugal German, Swiss, Scandinavian and other foreign immigrants who, following the habits acquired in their boyhood home, have produced dairy products, especially cheese, in variety and of a quality unexcelled elsewhere.

The cheese business of Wisconsin is carried on by about 1,650 cheese factories, having buildings and machinery estimated at a value of more than $2,000,000. To these cheese factories 34,000 patrons contributed in 1906 two hundred and six million, two hundred and fifty-five thousand pounds of milk from 348,850 cows, which produced 124,980,360 lbs., of cheese, and for this cheese the patrons received $13,907,600. Estimating the value of by-products at $10.00 a cow, the aggregate for by-products from cheese factories exceeds $348,000.

Proprietors, managers, cheese makers and butter makers, patrons, the Wisconsin Dairymen's Association, the dairy press, the Wisconsin Agricultural College, the Wisconsin Dairy School, the Wisconsin Cheese Makers' Association, the Southern Wisconsin Cheese Makers' Association, the Wisconsin Butter Makers' Association, the Wisconsin Farmers' Institutes, the Wisconsin County Agricultural Training Schools, the Wisconsin Dairy and Food Commission, the dairy supply men and cheese buyers and butter buyers, and other factors, have each contributed a share to the achievements before mentioned. The co-operation of all these factors is necessary for successful results. The failure of any one of them to perform properly his part must to that extent lessen successful achievement. Limitation of time precludes my speaking in detail ot each of these agences or forces.

The articles of incorporation of the Wisconsin Cheese Makers' Association declare as among the objects of this association, the education of its members for better work in the art of making cheese, the care and management of factories, the sale of their products and the weeding out of incompetency in the business of cheese making. That this association has made great progress in the accomplishment of these objects is a statement that I am sure will go unchallenged. The annual meetings of this association have surely grown in interest and in value from year to year. Corresponding with this the membership of the association has been enlarged from year to year and its influence extended. The annual reports contain discussions of the many topics involved in the cheese industry from the ablest and best authorities and constitute an up-to-date text-book on these subjects. The history of the annual meetings of this association is the ambodiment of the spirit of progress.

I am quite sure that I voice the unanimous sentiment of this association when I say that the wisdom displayed by the association, year after year, in the choice of its secretary has been a very large contribution to the magnificent success in the growth and beneficial results of the association. It is disparagement to no one when I say that the faithful and unselfish work and zeal of the secretary of this association in its behalf, in the preparation of its program, in the provision for the comfortable entertainment of the membership of the association, in the high quality of the speakers provided for its annual programs, in the premiums provided for successful competitors, in the educational scoring contests and exhibitions and in multitudinous other ways, have constituted a conspicuous feature in the successful history of this body. He has placed the interests of the association first and foremost in all his efforts. He has not exploited himself, but has been a quiet, impersonal force. He has sought harmony and not discord. Such a spirit becomes contagious.

It is known to this association, but not so well known to the public, that the better grades of all varieties of well-cured Wisconsin cheese have no superior anywhere in the world in like varieties; that inferior grades of cheese made in other states have been palmed off on Wisconsin consumers as Wisconsin cheese, and that the better grades of Wisconsin cheese have often been sold under the brand of another state.

I suggest that this association make provision whereby the editors of daily papers in this city be furnished samples of each variety of the prize cheese of this exhibit.

As I understand it, the accustomed annual scoring contest of the Wisconsin Cheese Makers' Association and the Monthly Educational Scoring Contest inaugurated two years ago and now continued by the Wisconsin Dairy School are merged for this meeting. As you are all familiar with the detailed work of these contests, I need not here enlarge upon that topic.

The quality of cheese of whatever variety is all important to the success of the enterprise. It is to improve the quality of the different varieties of Wisconsin cheese that these educational scoring contest and exhibitions have been established and are maintained. The cheese maker is the pivotal agent in securing the highest quality of cheese. He must see to it that the milk which is manufactured into cheese is produced under clean and sanitary conditions from cow to cheese factory. He must have knowledge, skill, tact and back-bone. An oyster can never be a good cheese maker.

The winning of the prize does not mean simply expert skill in the mechanical work of making the cheese. It means that to be sure; but it means more. It means that conditions have been created and maintained whereby milk of good quality has been obtained. It takes knowledge, skill, tact, perseverance, industry, courage, back-bone, to create and maintain such conditions. As before stated, these educational scoring contests and exhibitions tend to emphasize the necessity of these requisites and stimulate their activity. If he is to be regarded a benefactor who makes two blades of grass grow where only one grew before, what shall be said in praise of the man who brings it about that a prime cheese is made where only a poor cheese was made before?

Your product has been carefully examined and scored by three highly competent, expert judges. From month to month you have received from the dairy school comments on your cheese that pointed out its defects and suggested how they might be improved. It is only our friends who kindly tell us how we can improve. Our enemies do not want us to improve.

Because these special prizes stand for high quality. I take pleasure in awarding them. These contests, these awards, these special prizes, call the attention of the public to the high quality of Wisconsin cheese. I am sure that all those who have participated in these contests, though may have won no special prize, have yet gained what is of great value. They have gained new knowledge, new skill, and I trust new interest, new aspiration, new hope and renewed determination to succeed. Those of you who have improved by this experience have thereby gained a veritable prize.

DISTRIBUTION OF SILVER CUPS AND SPECIAL PRIZES.

The prizes offered by the association were twelve silver cups, and were awarded to the following:

American Cheese—First prize, J. L. Zehren, Marion. Wis.; second prize, Charles Rasmussen, Clintonville, Wis.; third prize, John Hoeppner, Marion, Wis.

Limburger Cheese—First prize, Ernest Regez, Jr., Blanchardville, Wis.; second prize. Ernest Regez, Sr., Richardville, Wis.; third prize. Jacob Senn, Belleville, Wis.

Brick Cheese—First prize, Casper Anderegg, La Crosse, Wis.; second prize, Ernest Regez. Sr., Blanchardville, Wis.; third prize, Ernest Regez, Jr., Banchardville, Wis.

Swiss Cheese—First prize, John Rothlisberger, Judah Wis.; second prize, Jacob Marty, Brodhead, Wis.; third prize, Jacob Hefty, Mt. Horeb, Wis.

The prize chairs offered by Hon. S. A. Cook of Neenah, Wis., were awarded to the first, second and third highest average of seven scores in the dairy school monthly scoring exhibitions: $35 chair to P. H. Kasper, Welcome, Wis.; $25 chair to N. L. Ropp, Wrightstown, Wis.; $15 chair to John Hoeppner, Marion. Wis.

The Marschall Dairy Laboratory prizes were awarded to the following: $50 gold watch to P. H. Kasper, Welcome, Wis.; $25 gold watch to J. L. Zehren, Marion, Wis.; $25 gold watch to

Math. Meyer, New Holstein, Wis.; $25 gold watch to H. W. Melchert, Seymour, Wis.

The Wyandotte Washing Powder prizes were awarded to the following: Gold watch to P. H. Kasper, Welcome, Wis.; set carving knives to John Hoeppner, Marion, Wis.; set carving knives to E. B. Mayhew, Greenbush, Wis.

The gold watch charm offered by Averbeck & Co. of Madison, Wis., was awarded to Mr. John Wehinger, Woodford, Wis.

The President: There are other prizes here to be awarded and I would like to have Mr. Parkin of Minnesota say a word to us in regard to that matter.

Mr. Parkin, Minn: We have with us Mr. J. F. McCarthy, of West Concord, Minn., the man receiving the highest score for the six months' scoring contest on cheese in Minnesota, and I would be glad to have him say a few words to this convention.

Mr. McCarthy, Minn.: I do not know what you would like to hear from me along the line of making cheese. When I first entered the Minnesota contest I had no idea what the prize would be, but after I got in and they announced the prizes I was anxious to come to Wisconsin as it had been my native state. I was born within forty or fifty miles of this city, at Waukesha, and I came down here with a selfish purpose to take back more than I left.

I do not expect to tell the Wisconsin cheesemakers how to make cheese. You have able men here who have forgotten, perhaps, more than I ever knew or will know about cheese making, but I am glad to meet the Wisconsin boys face to face. I am getting selfish and if I could I would have your association meet in Minnesota once.

I had the pleasure of winning the highest average in my state, but let me tell you boys, I want to thank my patrons for that which I did at the St. Peter convention. I got the right raw material or I never would have had the score. The first thing you want to look out for is the raw material. Of course you can make good cheese out of good material but it is hard work to make good cheese out of poor material. I am going to remain with you until the convention closes and go back to Minnesota feeling well paid for my trip. I thank you for your attention.

Mr. Parkin: I wish to announce that Mr. McCarthy's average score is 97.21 for the six months' contest. Mr. Fred Miller wins second with a score of 96.81. Mr. Miller was not able to be present.

Mr. Baer: I still have more. A purse of $15 will be divided among the members of the Muscoda Board of Trade, as follows: $7.50 to the member securing the highest score on American cheese; $5.00 to the member securing second highest score on American cheese, and $2.50 to member securing the third highest score on American cheese. Perhaps Mr. Noyes can tell us about that.

Mr. Noyes: The prizes are to be paid direct from the treasury of the Muscoda Board of Trade to the winners. They go to the people exhibiting cheese from the Muscoda Board of Trade.

Mr. Aderhold. The chairs you see up on the stage were donated by Mr. S. A. Cook, of Neenah. a gentleman who takes a great interest in this association as well as many more. He wanted to be here when these prizes were to be awarded. I saw him last evening and on account of some function in which he has to participate this evening, he cannot be present today but he said he would try and be present tomorrow.

Another party we ought to feel thankful to is the firm of J. B. Ford Company, the manufacturers of Wyandotte Washing Powder, which is taking great interest in this association and treating us like princes. and I think it is up to all the members of this association, at least, to give the goods of that firm a fair trial. I think we owe the concern that much at least and if we can get our patrons to give the Wyandotte goods a trial some of us may have a good deal cleaner cans than we otherwise would have.

Secretary Baer. Just a word as to the pro rata premium fund and diplomas. We have been pretty busy the last day or two and the manner in which some of these prizes were awarded have made it a tremendous lot of work to get the average score and award these special prizes, and that has made it impossible for us to get our cash premium fund ready for today. You cannot leave town anyway. Becker's car of coal will go to nobody but a cheesemaker and in order to get it he must be present in person. Some of us will be short of money by that time and the pro rata will be just the thing.

WINNERS OF PREMIUM FUND.

Names and addresses of exhibitors participating in the association cash pro-rata premium fund:

Joseph Bergs	Edgar, Wis.	95.58
Anton Benishek	Kellnersville, Wis.	96.83
Chas. Beeman	Viola, Wis.	94.91
Louis J. Blahnik	Kewaunee, Wis.	95.33
A. A. Cross	Mauston, Wis.	93.00
P. E. Cranston	Soldiers Grove, Wis.	95.25
Matthew De Haan	Lineville, Ill.	93.16
M. G. Douma	Cleveland, Wis.	94.33
W. D. Fecker	Kiel, Wis.	93.83
J. A. Fuller	Lancaster, Wis.	95.33
John Fisher	Boaz, Wis.	93.75
M. J. Gregorius	Appleton, Wis.	95.00
Arnold Grimm	Fremont, Wis.	95.16
B. Griese	Black Creek, Wis.	95.25
O. F. Greunke	Clintonville, Wis.	95.33
F. J. Harder	Hilbert, Wis.	95.00
W. B. Hatch	West Bend, Wis.	94.00
John Hoeppner	Marion, Wis.	97.00
Emil B. Hosig	Mayville, Wis.	92.18
F. E. Hannawell	Livingston, Wis.	95.33
N. Jennings	Readstown, Wis.	94.33
A. C. Koopman, Jr	Pt. Washington, Wis.	94.33
J. J. Kuhn	Cleveland, Wis.	93.83
Oscar Knudson	Montfort, Wis.	94.66
Geo. J. Kust	Neillsville, Wis.	95.50
P. H. Kasper	Welcome, Wis.	96.16
E. Kopping	Sawyer, Wis.	95.33
Wm. Kuehl	Kewaunee, Wis.	96.00
Jas. Lord	Ithaca, Wis.	95.00
E. B. Mayhew	Greenbush, Wis.	93.16
Ed. Maedke	Stanley, Wis.	94.50
Math. Meyer	New Holstein, Wis.	95.00
Anton Mueller	Hayton, Wis.	92.50
R. A. Murray	Yuba. Wis.	96.50
L. Novotny	Grimms, Wis.	94.83
H. L. Noyes	Muscoda. Wis.	95.75
Chas. H. Patt	Van Dyne, Wis.	94.25
H. F. Pieper	Eden, Wis.	93.58
A. F. Peterson	Appleton, Wis.	95.16
H. W. Priebe	Kewaunee, Wis.	95.33
N. L. Ropp	Wrightstown, Wis.	96.16
L. O. Rehm	Elkhart, Wis.	92.41
Chas. Rasmussen	Clintonville, Wis.	97.16
T. W. Schreiber	Kiel, Wis.	94.33
A. J. Schulte	Hilbert, Wis.	94.41
E. J. Schwingel	Avoca, Wis.	94.58
Albert Schauf	Neptune, Wis.	95.83
E. S. Snyder	Bloom City, Wis.	93.50
G. Steinhart	Kewaunee, Wis.	94.83
J. J. Stockker	Dale, Wis.	94.50
H. M. Scott	Waldo, Wis.	93.08
T. A. Ubbelohde	Glenbeulah, Wis.	96.08
H. Verhulst	Oostburg, Wis.	94.83
John Vogt	Fremont, Wis.	97.08

Pat. Wallace	Hortonville,	Wis.	95.50
William Waddell	Hub City,	Wis.	95.66
Wenzel Zlab	Two Rivers,	Wis.	93.66
Peter Zehren	Marion,	Wis.	97.66
J. L. Zehren	Marion,	Wis.	97.33
Casper Anderegg	La Crosse,	Wis.	98.00
Chris. Bigler	Clayton,	Wis.	92.00
C. F. Brinkman	Coon Valley,	Wis.	94.62
J. W. Falk	Mayville,	Wis.	92.00
Louis Hasse	Juneau,	Wis.	95.50
Oscar Kramer	La Crosse,	Wis.	94.50
Jac. Karlen	Monroe,	Wis.	95.25
Chris. Kohli	Mayville,	Wis.	96.62
G. Muhleisen,	Alma,	Wis.	96.25
Geo. L. Rendler	Coon Valley,	Wis.	94.75
Ernest Regez, Sr	Blanchardville,	Wis.	97.25
Ernest Regez, Jr	Blanchardville,	Wis.	96.75
J. Rothenbach, Jr	Ackerville,	Wis.	94.50
Carl Schmidt	Oconomowoc.	Wis.	92.75
Alex Schaller	Barneveld,	Wis.	96.25
John Altman	Mineral Point,	Wis.	95
Jacob Karlen and Son	Monroe,	Wis.	95.75
Henry Zweifel	Warren,	Ill.	96.25
Unknown	Unknown,	Wis.	96.50
Jos. Ackerman	Monroe.	Wis.	96
J. R. Beddulph	Tiskilwa,	Ill.	93.50
Jacob Hefty	Mt. Horeb,	Wis.	95
Joe Huber	Monroe,	Wis.	96.87
Jacob Karlen	Monroe,	Wis.	95
Jacob Karlen and Son	Monroe,	Wis.	95.50
Alex Lisser	Darlington,	Wis.	94
Jacob Marty	Brodhead,	Wis.	97.50
Henry Meyer	Darlington,	Wis.	94
Ernest Regez	Blanchardville,	Wis.	95.25
Ernest Regez and Son	Blanchardville,	Wis.	96.50
John Rothlisberger	Juda,	Wis.	98.12
Herman Schoepfer	Hollandale,	Wis.	94.25
Fred Schenkel	Calomine,	Wis.	94.25
Jac. Schurtter	Argyle,	Wis.	95.25
Louis Urfer	Monroe,	Wis.	93
Gottlieb Vogel	Mt. Horeb,	Wis.	95.25
John Wehinger	Woodford,	Wis.	99

Signed;

F. E. Carswell, *Treasurer.*
U. S. Baer, *Secretary.*

ROLL OF HONOR.

Names and addresses of exhibitors awarded association diplomas of merit for the year 1908:

Name.	*Address.*	*State.*
Joseph Bergs	Edgar	Wisconsin
Anton Benishek	Kellnersville	Wisconsin
Charles Beeman	Viola	Wisconsin
L. J. Blahnik	Kewaunee	Wisconsin
A. A. Cross	Mauston	Wisconsin
P. E. Cranston	Soldier's Grove	Wisconsin
Matthew De Haan	Lineville	Iowa
M. G. Douma	Cleveland	Wisconsin
W. D. Fecker	Kiel	Wisconsin
J. A. Fuller	Lancaster	Wisconsin
John Fisher	Boaz	Wisconsin
M. J. Gregorius	Appleton	Wisconsin
Arnold Grimm	Fremont	Wisconsin
B. Griese	Black Creek	Wisconsin
O. F. Greunke	Clintonville	Wisconsin
F. J. Harder	Hilbert	Wisconsin
W. B. Hatch	West Bend	Wisconsin
John Hoeppner	Marion	Wisconsin
Frank Haack	Casco	Wisconsin
Emil. Hosig	Mayville	Minnesota
F. E. Hannawell	Mt. Horeb	Wisconsin
U. L. Johnson	Avoca	Wisconsin
N. Jennings	Readstown	Wisconsin
A. C. Koopman	Port Washington	Wisconsin
L. Kohlmann	St. Cloud	Wisconsin
J. J. Kuhn	Cleveland	Wisconsin
Oscar Knudson	Montfort	Wisconsin
George J. Kust	Neillsville	Wisconsin
P. H. Kasper	Welcome	Wisconsin
E. Kopping	Sawyer	Wisconsin
William Kuehl	Kewaunee	Wisconsin
James Lord	Ithaca	Wisconsin
E. B. Mayhew	Greenbush	Wisconsin
Edward Maedke	Stanley	Wisconsin
Mathew Meyer	New Holstein	Wisconsin
Anton Mueller	Hayton	Wisconsin
R. A. Murray	Yuba	Wisconsin
J. A. Neuell	Merrill	Wisconsin
L. Novotny	Grimms	Wisconsin
H. L. Noyes	Muscoda	Wisconsin
Charles H. Patt	Van Dyne	Wisconsin
H. F. Pieper	Eden	Wisconsin
A. F. Peterson	Appleton	Wisconsin
H. W. Priebe	Kewaunee	Wisconsin
N. L. Ropp	South Kaukauna	Wisconsin
L. O. Rehm	Elkhart	Wisconsin
Charles Rasmussen	Clintonville	Wisconsin

Name.	*Address.*	*State.*
T. W. Schrieber	Kiel	Wisconsin
A. J. Schulte	Hilbert	Wisconsin
E. G. Schwingel	Avoca	Wisconsin
Albert Schauf	Neptune	Wisconsin
E. S. Snyder	Bloom City	Wisconsin
G. Steinhart	Kewaunee	Wisconsin
J. J. Srockker	Dale	Wisconsin
H. M. Scott	Waldo	Wisconsin
T. A. Ubbelohde	Glenbeulah	Wisconsin
H. Verhulst	Oostburg	Wisconsin
John Vogt	Fremont	Wisconsin
Patrick Wallace	Hortonville	Wisconsin
William Waddell	Hub City	Wisconsin
W. Zlab	Two Rivers	Wisconsin
P. Zehren	Marion	Wisconsin
J. L. Zehren	Marion	Wisconsin
Joseph Ackerman	Monroe	Wisconsin
J. R. Biddulph	Tiskiwa	Illinois
Jacob Hefty	Mt. Horeb	Wisconsin
Jacob Karlen	Monroe	Wisconsin
Jacob Karlen & Son	Monroe	Wisconsin
Alexander Lisser	Darlington	Wisconsin
Jacob Marty	Brodhead	Wisconsin
Henry Meyer	Darlington	Wisconsin
Ernest Regez	Blanchardville	Wisconsin
Ernest Regez & Son	Blanchardville	Wisconsin
John Roethlisberger	Juda	Wisconsin
Herman Shoefer	Hollandale	Wisconsin
Fred Schenskel	Calomine	Wisconsin
Jacob Schurtter	Argyle	Wisconsin
Frank Scheurman	Belmont	Wisconsin
Rudolph Urben	Ridgeway	Wisconsin
Louis Urfer	Monroe	Wisconsin
Gottlieb Vogel	Mt. Horeb	Wisconsin
John Wehinger	Woodford	Wisconsin
John Altman	Mineral Point	Wisconsin
Jacob Karlen & Son	Monroe	Wisconsin
Ernest Regez, Jr.	Blanchardville	Wisconsin
Ernest Regez, Sr.	Blanchardville	Wisconsin
Jacob Senn	Belleville	Wisconsin
Otto Sommer	Cedarburg	Wisconsin
Henry Zweifel	Warren	Illinois
An unknown		Wisconsin
C. Andregg	La Crosse	Wisconsin
Chris Bigler	Clayton	Wisconsin
C. F. Brinkman	Coon Valley	Wisconsin
Reinhard Boenfeldt	Burnett Junction	Wisconsin
J. W. Falk	Mayville	Wisconsin
Henry Hoesley	Turtle Lake	Wisconsin
Louis Hasse	Juneau	Wisconsin
Oscar Kramer	La Crosse	Wisconsin
Chris Kohli	Mayville	Wisconsin
Jacob Karlen	Monroe	Wisconsin
G. Muhleisen	Alma	Wisconsin
G. L. Rendler	Coon Valley	Wisconsin
E. Regez, Sr.	Blanchardville	Wisconsin
E. Regez, Jr.	Blanchardville	Wisconsin

Name.	*Address.*	*State.*
J. Rothenbach, Jr	Ackerville	Wisconsin
Carl Schmidt	Oconomowoc	Wisconsin
Alexander Scha ler	Barneveld	Wisconsin

Judges:
  Math. Michels, Madison, Wis.
  J. D. Cannon, New London, Wis.
  J. W. Moore, Madison, Wis.
  Gottlieb Marty, Madison, Wis.
President:
  Math. Michels, Madison, Wis.
Secretary:
  U. S. Baer, Madison, Wis.

The Chairman: Next on the program for this afternoon is a short statement by the prize winners in the different classes, how they made their cheese, then we will have a discussion on what a good cheese is and the cutting of the prize cheese. Before taking that up, however, we will again be favored by a solo by Mrs. Kempfer.

Swiss Yodel song by Mrs. Kempfer.

Mr. Wallace: Mr. Chairman, I move that the Swiss cheese makers tell us how they made the prize cheese.

Motion seconded and carried, but the Swiss prize winners not being present, the winner on brick cheese, Mr. Casper Anderegg, was called on.

SHORT STATEMENTS FROM PRIZE WINNERS.

HOW I MADE MY PRIZE WINNING BRICK CHEESE.

Casper Anderegg, La Crosse, Wis.

Mr. Chairman, Ladies and Gentlemen:

I do not feel competent to come before you here as an expert on making brick cheese. I almost call myself accidentally fortunate to have the honor of receiving the prize which has been awarded to me, for which I wish to extend to the officers of this association hearty thanks.

In regard to making brick cheese, I receive my milk generally in the morning. We receive it on a platform and the cheesemaker has to open every can himself. The cheesemaker is instructed to stand right by the can and try to catch the odor from the can as soon as he opens it, and if it is o. k. it is dumped into the weigh can. On the weigh can I have a strainer; the milk is supposed to be strained before it arrives at the factory and it is also strained before it goes into the weigh can, and so it enters the vat.

The first thing in order is to warm up the milk. I try to warm it up gradually and not in too much of a hurry. In winter time we receive very cold milk but I never consider it wise to turn on too much steam so as to heat it around the pan. Warm the milk gradually and keep it in a moving rotation in order not to create cream. In the meantime we prepare the rennet. As I stated in my entry blanks, I am using home made rennet, and we follow a method which has been discussed here for the last few years. After we get our milk warm we take five parts milk and one part rennet extract the way we have it reduced and tested, have a measure for every two hundred pounds and use so much rennet extract, and if the milk is weaker or stronger one day than another we either strengthen or reduce the rennet extract accordingly. I want my rennet extract just so and have a measure, using so many pounds of milk and so many ounces of rennet extract, and I use a starter winter and summer.

The assistance I have received by our monthly contests, and profiting by the mistakes I have made, which have been reported to me, I feel has placed me in position to remedy my defects and helped me to receive the score I have today.

Going further, I allow the milk from twenty to thirty minutes, about twenty-five on the average, to coagulate; in cutting, until I turn on the steam, I want twenty minutes; in cooking I want thirty minutes. If I am not mistaken the cheese I had entered here was cooked up to 104, and I keep it in rotation until I have the curd in the shape I want it. I cannot tell you exactly how I want it, but after I have it just as I want it I draw the whey off and dip it out in the moulds, and I turn them over three times a day, that is every eight or nine hours. I have eight to eight and a half pound weights. After I put them in the cellar they are salted for three days, turned over and salted every evening. The next day the first batch of cheese on the shelf should have a slight wash with salt water. The reason we do that is to get a nice smooth rind on the cheese. I use tin moulds in my factory. You cheesemakers who use wooden moulds perhaps have to follow out a different process in that matter, but handling my cheese with tin moulds I get them sufficiently dry by washing the first day after it is put on the shelf, so I continue washing that cheese with salt and water three times every other day, and after that I wash the cheese whenever I think it is necessary, when it is either too dry or too wet. It has to be turned over and the boards cleaned in order not to have a Limburger odor on the brick cheese in case the boards should get damp.

As the time is limited I will not say anything more on the process of cheese making but will give the other winners an opportunity to speak but I do wish to say a few words to my fellow cheesemakers. Let us go hand in hand and work our responsible men that are opening their arms for us, inviting us to come in. Let us have our cheese tested and let us get good advice from those that are older and more experienced than we are. I could name those gentlemen but you all know them. You all heard what Professor Emery said and the advice he has given us. We should take that up, consider it and believe it. It is worth it. Let us try to improve our cheese and it will be a matter of greater pride to ourselves than to any other.

Again I want to say that I am indeed pleased and proud to receive this honor at your hands but I must not forget to share this honor with my patrons for having supplied me with the excellent milk which made it possible for me to secure such high scores on my cheese. My patrons, who have produced clean pure milk are to be credited with the larger share of our success in these contests. I assure you that my patrons and myself will strive at all times to place before the public a nice clean pure article of brick cheese.

The President: We would like to have the pleasure of having a short statement from the Limburger cheese prize winner. He has two cups, first and third prizes. We will ask Mr. Ernest Regez, Jr., to tell us how he made his prize winning cheese.

Mr. Regez: I am a dealer and bought the cheese and cannot say how it was made.

Member: Mr. Chairman, we passed a resolution last year that no one but a cheese maker could carry off a prize.

The President: I think that is the way that it should be.

Member: It is a good thing for a dealer to come here and get prizes; he has a better place for curing than an ordinary cheese maker.

Mr. Regez, Sr.: The cheese we exhibited here was made from milk we bought from the factory. Of course we buy lots of cheese also but two or three boxes of cheese exhibited are our own product.

Mr. Wallace: Can you tell the name of the man who made the cheese?

Mr. Shaller: I was on the committee on resolutions last year and we passed a resolution that the dealer could exhibit cheese but the prize should go to the maker.

Mr. McCarthy, Minn.: I would like to offer a few suggestions. I tell you boys this is a Wisconsin Cheese Makers Association and the cheese maker ought to get the benefit of it. I believe in giving the man that owns the factory the credit of having the prize cheese made in his factory, but the maker ought to get the full benefit. It is an educational contest and that is where you want to put it.

Mr. J. G. Moore: There may be a conflict between the resolution passed last year and the by-laws as originally worked under, and no doubt it is the duty of the officers to go by the by-laws as far as possible. It looks as though there were a sort of mix-up and now is the time to have it right. I have no doubt that the gentlemen here who are manufacturers and owners of factories are anxious to do everything in their power to have their makers produce a better grade of cheese and they should be willing to agree to have the prizes offered by the association go to the makers. If I owned a factory and my maker got first prize I would be anxious to advertise the fact that my maker could make that kind of cheese. As it is now we do not know who the man is who was so successful in his work as to make this particular cheese which took first prize. I think this came up at the first or second convention of the Wisconsin Butter Makers' Association at which the man who won first place did not get the prize, but we cannot take away the honor of having made first prize cheese by giving the place to the second man, and when the second man receives a cup that says "First Place" on it, it is no credit to him to show it.

Mr. Decker: Mr. Chairman, I move that when entries are received they shall be received in the name of the cheese maker, and regardless of who exhibits the cheese, the maker of that cheese is entitled to whatever premiums are awarded to such cheese.

Motion seconded and carried.

Mr. Anderegg: I think it would be better for the association to read the scores the second day of the convention. We realize that we met people in this hall this afternoon, who came in after the scores were read, did not expect they would be read so early, and therefore I would like to offer the following resolution, that the premiums be awarded to the cheesemakers that have the highest scores, providing they have paid their entry fee and membership, whether they are here or not, through sickness or some accident, if they come later on or if they advise the secretary the reason for their not coming and have some one here to represent them.

Motion seconded and duly carried.

The Chairman: If there is no further business we will now stand adjourned until tomorrow morning.

THURSDAY MORNING SESSION.

Meeting called to order at 10 A. M. by President Michels, the first number on the program being a solo by Mrs. Kempfer.

The President: Our first papers this morning are ten prac-practical lessons by ten practical cheesemakers each lesson to be limited to five minutes. As Professor Moore is obliged to leave on an early train, we will arrange to have part of the lessons first and then call on him.

The first of these lessons is Qualifications Necessary to be an Up-to-date Cheese Maker, by Mr. A. T. Bruhn, Spring Green, Wis.

THE QUALIFICATIONS NECESSARY TO BE AN UP-TO-DATE CHEESE MAKER.

A. T. **Bruhn**, Spring Green, Wis.

First and foremost he should be a live, active member of the Wisconsin Cheese Makers' Association.

He should be an exhibitor at some of the fairs and educational scoring contests.

He must be sufficiently broad minded to get the patrons' point of view, and not only his own.

He must be manly enough to inspire sufficient confidence in his patrons that they will willingly leave the management of their greatest source of income to him. He must possess sufficient tact to reject unfit milk without antagonizing the patron who brought it, but be able to suggest the remedy in a kindly man to man way.

He must be honest. Nothing short of absolute honesty works here. Without honesty he cannot hold the confidence of his patrons and if he has not that then for him it is quitting time.

He must be intelligent. He must know every detail of his own business and the more he knows outside of that the better it will be for himself and all concerned.

Professor King says, "Strive to know why, for this teaches how and when." And I doubt if this is more true in any business than in cheese making. A cheesemaker should know the why of every detail of his work from the weighing and samlping of the milk until the whey is in the farmers' whey barrel.

He must also know how to care for the cheese until sold, keep well posted on the markets in the different parts of the country, and it is mighty healthy for him to understand the methods of the buyer and the cold storage, the jobber and wholesaler, because the cheese buyers are not all angels and unless you know something of their methods they are apt to get quite a little the best of you. Depend on their getting the best of you anyway but look out they don't get too much the best.

Not only must he know his own business thoroughly but he should know considerable about farming so that if he is asked for advice by his patrons he can give it intelligently.

He should be able to judge dairy cattle, be able to explain thir good and bad points, and if he knows enough of veterinary elements that he can assist in cases of trouble in a herd, such as milk fever, abortion and the like, so much the better.

An up-to-date cheesemaker should know and be able to handle the tuberculine test. He should know what is the best and cheapest feed to raise in his particular locality and be able to formulate a ration for their different kinds of stock from the available food stuffs. He should be able to give sound advice on barn construction especially as to location, drainage, light and ventilation and the construction of floors.

Then right along with the feeding and care of dairy cows comes the care of the milk. Not all of the patrons can handle the milk in the same way, and he must be able to show each man the most advantageous method adapted to his particular circumstances.

And last but not least he must be a good workman.

A cheesemaker's work is not a soft snap. The hardest work comes in the hottest part of the year and if he fights gas till an ungodly hour one day he must be fresh as a daisy to greet his patron with a pleasant smile and good morning next day.

Through it all he must keep his factory and utensils neat and clean, for a slovenly cheesemaker has no right to expect clean and wholesome milk from his patrons which is the beginning of the end.

DISCUSSION.

The President: Have you any questions you desire to ask Mr. Bruhn in regard to this subject? I think a number of you have something to say about this.

Mr. Dassow: I would like to ask the gentleman how he arranges in the morning to go after his patrons without getting them angry and insulting them?

Mr. Bruhn: I have made cheese for thirteen years and do not believe I ever insulted a man yet at the weigh can and I think I have not taken in any poorer milk than the average cheesemaker in the state. I have not had one piece of cheese rejected this summer and I think that speaks for itself. I do not believe it is necessary to insult a man because you have to send his milk home. You can tell him the defects in a kindly way and there is not a man but will agree with you in case his milk is off, but be careful not to complain of his milk when he thinks it is not off. When he thinks his milk is good you have to explain to him where it is off and if he wants it proven, you must prove it to him. We have methods of proving the quality of the milk, we have the curd test, the acidemeter, or some form or other, and we can prove to him whether his milk is fit for making cheese or not, and in my experience I have never had a man object because I sent his milk home.

Mr. Dassow: What do you do if a man comes to the factory late and insists on coming late?

Mr. Bruhn: That, perhaps, is one of the hardest things we have to contend with and I think the gentleman knows it. If a man insists on coming late I generally send his milk home. I figure that a man that does not come in, say until nine o'clock, a factory is better off without. I would rather let the other fellow have his milk and I send it home for that reason. If I know he is coming I generally arrange to hold a vat if I possibly can, but if I cannot hold it I send his milk home and I have had no objection on that score either.

Mr. Dassow: What do you do to a man that always says "Yes" to everything and goes home and does the same thing over again.

Mr. Bruhn. Where are you located. That is something I never ran up against. I do not know what I would do in a case like that

Mr. Dassow: I can tell you what I did, I got the inspector out and it helped him and helped all the rest of the patrons.

Mr. Bruhn: So far as my patrons are concerned, it has never been necessary to call the inspector. When I called the inspector it was to help myself.

Mr. Aderhold: I suggest that if Mr. Dassow has a man like that he will try and make him say no.

Mr. Larson: What do you do with a man that is all the time doing the things that are right?

Mr. Bruhn: I expect him to do the right thing. I am trying to do my best for him and I expect him to do his best for me.

Mr. Larson: Would it not be good policy to give expression of the fact if a man does that all the time?

Mr. Bruhn: If a man has brought me good milk all the year, I generally have an annual meeting at the end of the year's business and we have a little confidential talk with each other, and sometimes I manage to give them a little talk on the latest practices in dairying, etc., and in those cases I generally recommend those people that are doing the best and hold them up as an example for the others; but, outside of that, I expect every one of my patrons to do the best they can under their conditions. I am working as hard as I can for their interests and expect them in return to work just as hard for my interest.

The President: Don't you think when a man comes along with a nice can of milk you would be apt to tell him it is good? By telling him about it when his milk comes in good one day, you have a better chance to tell him of it if his milk is off the next.

Mr. Bruhn: I came near getting into trouble at one time doing that. I got a batch of milk that I thought was excellent. I took a test with the acidemeter and it showed less than .15% of 1% acid; it was cold and nice, tasted as sweet as could be. I took the curd test and found it was the worst milk I got in the factory, that is it cost me more trouble, so I am a little chary of giving much praise in that way.

Mr. Dassow: When a man is bringing good milk, is he not doing his duty and no more?

Mr. Bruhn: That is what I meant to say. He is doing his duty to himself and to the cheesemaker. We know we have to have good milk and impress that on our patrons' minds as much as possible. If a man does not bring good milk he knows he is trespassing on the rights of someone else, consequently he is not doing his duty and is only doing his duty when he brings good milk, so for that reason and a good many others I do not think he is doing anything special because he is bringing good milk. I do not believe in awarding a premium to the man that is bringing the best milk because it is only his duty to do that. It is a little like giving a boy five cents for being good.

Mr. Grimm: I would like to ask the gentleman to explain what made that batch of milk the poorest after it was tested.

Mr. Bruhn: I am not able to tell. At the time I was bothered to quite an extent with yeasty fermentation. It did not show up in the vat until four or five hours after the whey was run off when I should have been able to put the curd in the press, and then it began to show up in the form of small pin holes and this worked for several hours; if I put it in the press it worked on the shelf for several days and got to be huffy cheese. The man bringing that batch of milk was neat and clean and his premises were neat and clean. The only reason I could see was that his milk was not cooled rapidly enough. I think most of the trouble comes to milk after it has been drawn from a cow.

The President: If there are no other questions we will take up the next paper, by Mr. George Beck of Lindon, Wis.

CARE OF MILK FOR CHEESE MAKING.

GEORGE BECK, Lindon, Wis.

I have been asked by the Secretary to read a paper on the care of milk for cheese making. This is indeed an old and well worn subject but we dare not drop it. The question of today is how should milk be cared for for the manufacture of cheese, and how should we instruct the farmer so as to get a good product from the farm. We as cheesemakers must fight against bad flavors and impure milk, or we cannot make a good product. So I think the first thing to impress upon the farmer is in regard to the feed, water, and care the cow gets. The next thing is in being clean. In milking, this don't mean that the man necessarily has to wear a white suit, to be clean, but it does mean he should have clean hands and clean clothing. Also should the milk utensils be kept perfectly clean, and all seams flushed full of solder, for there are so many cheap pails used that are simply thrown together. Some of them will hold milk büt it gets into the seams and cannot be washed out properly, therefore will decay and help to spoil all milk that comes in contact with it.

In regard to washing pails or cans it isn't a good practice to use a dish rag, as a good many do, for a dish rag is not always free from bad flavors. Therefore would advocate using a brush and warm water and then rinsing with scalding water. They should then be placed on a rack or table out in the sun. This airing seems to be a great help to the keeping of milk. The question often comes up or is quite frequently asked, "What kind of cans would you advise a farmer to buy if he ask you for advice." I should advise him to buy nothing but 15 or 20 gallon cans. For the average farmer two of these cans are large enough. Where he has a 30 or 40 gallon can he will mix the night and morning milk and this certainly isn't a good practice and is unhandy to handle when all in one can and besides the milk is libale to take a return trip some morning. then all his milk is lost for that morning and perhaps caused by mixing. By no means ever advise a farmer to get the narrow necked cans, for it is hard to air the milk and they are very difficult to wash clean and therefore will cause bad flavor.

There are 3 causes for bad flavor in milk; 1st, from strong foods; 2nd, from absorption, and 3rd, from bacterial infection.

I am not going to speak of all of these but would like to say a few words in regard to absorption. A good many people think milk will not absorb taint while it is warm and therefore let it set around the stable or almost anywhere. I think this is where they are mistaken, for that is just when it will absorb taint very readily. Therefore milk that is put in the watering tank to be cooled should be stirred and cooled at once, and the lid put on, for as a rule the watering tank is in the barnyard or somewhere where there isn't much pure air.

Some farmers are using ærators and are getting very good results. There are several different kinds of ærators and it is hard to say which is best, for what suiis one would not suit another. But if milk is aired and cooled down to 60 degrees F. and the cheese maker doesn't make a good piece of goods it certainly isn't a fault of the farmers. Then the farmer has a chance to condemn the cheese maker and it is true a good many should be condemned.

DISCUSSION.

Mr. Dassow: Do you think the aerator is the proper thing to use?

Mr. Beck: Yes if it is used where the air is pure, but if used somewhere about the barn I think it is not a good practice because the milk would absorb much taint while aerating.

Member. Where is there pure air of any kind in the summer months, air free from germs?

Mr. Beck: I think it is possibe that air is purer in some places than in others. If the milk is aerated near the barn, one thing is sure and that is that there will not be good results obtained.

Mr. McCarthy: How many farmers do you think take their aerator out where the air is pure? The most of them aerate it in the barn.

Mr. Zumkehr: I would like to ask if this man claims it is sufficient to cool the milk to 60 degrees?

Mr. Beck: Yes I think it is. I dare say a man could make good cheese by cooling down to even 65 degrees, but the cooler you get your milk the better it is for the cheesemaker and also for the farmer.

Mr. Zehren. Does the gentleman think there is any air purer than the milk when drawn from a cow?

Mr. Beck: No I do not. It only helps the milk when it is tainted when it comes.

Mr. Zehren: The question is, do you think that good pure milk, as good as you can get it from the cow is improved by contact with the air, by aerating it?

Mr. Beck: No I do not. It s only aerated because it is not pure.

Mr. Bruhn: Is all milk pure when drawn from the cow?

Mr. Beck: No I do not think it is all free from taint.

Mr. Bruhn: If cows are healthy is it not actually pure?

Mr. Beck: I do not think it is.

Mr. Scott. There are some bacteria that follow up the milk duct.

Mr. Bruhn: I think the poor milk is generally drawn to the ground. Do you think you improve the milk by aerating it? Do you think you remove the food taints by aerating the milk?

Mr. Beck: Yes I think so.

Mr. Good: I think an aerator is used more to cool the milk.

Mr. McCarthy: If milk is drawn from the cow and immediately put into a clean can thoroughly stirred so the water will always strike on the outside of the can, I think we are better off without the aerator. I think the aerator is a good deal like the old water separator and I have no use for either of them.

Member: I would like to ask if you recommend closing the cans tight after the milk is cooled down to 60 or 65 degrees?

Mr. Beck: Some say it is a good thing but I have never considered it so. After milk is cooled to 60 there is not much danger of causing gas there by closing it up tight.

Member: I think if the can is closed tight after the milk is cooled off there is no chance for germs to get in that milk.

Mr. Dassow. I have my patrons so educated that they put their cover on while they are milking, do not open it more than is necessary and I get the best results.

Mr. Wallace: I think an aerator is a good thing. There has been a bulletin issued stating that there is not much damage done to milk by aerating it in a fairly clean place. When the morning's milk is to go with the milk of the night before it will not be cool, but if the aerator is used the patrons are going to deliver the milk quite a little cooler to the factory than if they have not used it. I think if all the patrons would use an aerator they would get the morning's milk to the factory in better shape.

Member: I tell my patrons to cool the evening's milk and the morning's milk separately before mixing.

Mr. J. W. Moore: Is it not essential in cooling milk to see that cream does not come over the surface of the milk, and if the milk is stirred occasionally to break up that cream, is that not the thing desired? If the milk is simply cooled down and not stirred does not that cause trouble? If it is stirred with a dipper as good results may be obtained as by aerating and the chance for contamination will not be so great.

Mr. Schwingel: I would like to ask this gentleman whether his patrons have twenty gallon cans, or thirty or forty gallon cans? There is a difference in the locality from which the milk comes. Up in Sheboygan district they are better equiped as dairymen, they have twenty gallon cans, water tanks to put the cans in, they can strain their milk and it cools as rapidly as they put it in. The farmers in my locality only have two cans, and have to strain their milk, aerate it or do something to get their milk in shape to bring it to the factory in good condition. We have to take into consideration the different localities. I have made cheese in Sheboygan county and found it the easiest place I ever found in fourteen years experience in making cheese. In our locality for three months in the year we have to contend wth gas. I think that is the reason for the different ideas of cheesemaker in regard to this matter, because they cannot teach their patrons to put their cans in water and use the same methods as are used in Sheboygan County and many other places.

The President: A good many years ago I had quite a few patrons on my books and I got them all to buy aerators. They used them for a number of years but there came a time when I did not want them to use them and for a good many years we have not used any aerators. I think very often the aerator is abused and I believe on the whole the aeration of milk does not do any good except to cool it. On the whole I think it is a danger instead of a benefit to the cheesemaker.

Mr. Parkin: My experience is that when a patron runs his milk through the aerator he considers that is all that is necessary to do to his milk, never set it in water, and as a result I got better milk from the patrons without the aerator.

Mr. Haskins: I have patrons that cool their milk in different ways, some that use the aerator entirely, others that cool by water. and I have good results both ways. I have also had some patrons that use both aerator and water and I have had very good results that way.

Mr. J. W. Moore. It would be rather a dangerous thing to advise the patrons to use the aerator alone because the time of the year you need to take the best care of your milk is the time when the temperature runs as high as 80 in the evening when the farmer uses the aerator, and how will he get his milk cool enough with the aerator alone?

Mr. Dodge: I think the location of the aerator makes a good deal of difference at the time it is used. I have seen milk aerated in barns where the stable odor was very strong.

Mr. Wallace: I think most of the trouble with milk comes from the fact that it is not either aerated or cooled.

The President: I believe we wlll have to close this subject and take up the next one, which is to be handled by Mr. P. H. Kasper, of Welcome. Mr. Kasper is the man who took so many prizes here and I hope you will go for him.

RECEIVING MILK AT THE WEIGH ROOM.

P. H. Kasper, Welcome, Wis.

The subject assigned to me by our worthy secretary, Baer, Receiving Milk at the Weigh Room, you will all agree with me, is one of the most vital and important subjects pertaining to the manufacture of fancy cheese. To begin with we must impress on the minds of our patrons the idea that we are jointly interested in each others welfare for the purpose of getting the most money out of our product.

We must impress upon their minds the losses that are sustained in trying to make a good article out of poor milk.

We must teach them the proper care of milk and all utensils used in connection with it. You must show your patrons the vital points necessary in the care and cleanliness to produce good milk.

You must show them that you know the proper kind of milk necessary to make a good cheese and must take nothing else, no matter who it is.

We must be firm in our dealings and when a patron offers a can of milk and you tell him once that you cannot eccept it, don't take it under any circumstances, for the moment you accept a can of dirty or tainted milk you will not only offer an inducement for the farmer to produce dirty milk but you will create a market demand for such milk, and the next morning you will have another patron that has a can of milk that is not up to the standard but he will ask you to accept it simply because you took his neighbor's milk the day before.

In that way you will not only ruin the reputation of your factory, but your reputation as a cheesemaker will also be at stake, besides you are violating the Laws of the State of Wisconsin. By all means honor and obey the State Dairy and Food Laws, for they not only protect the consumer but the farmer and cheesemaker as well.

Some of my brother cheesemakers will tell me that they cannot reject any and all milk that is not up to the standard, for fear that some of their patrons might leave and go to their neighbor's factory. But let me tell you and impress upon your mind always rather sacrifice a patron than a principle. Set your standard high and retain it. Don't wait for the assistant State Dairy and Food Inspector to come to send home your dirty milk or compel you to send it home. What impression must such a cheesemaker produce on the minds of his patrons if that should be the case?

You must convince your patrons that all milk that passes your inspection will also pass to the entire satisfaction of our State Dairy and Food Inspectors.

The cheesemaker is, to a great extent, responisble for the quality of milk received at his factory. The standard of your milk received at your factory will be governed by the standard you set it. If you set your standard high you will receive a high quality of milk. If low you can expect nothing else but a low quality of milk.

But before we can ask our patrons to accede to all these rules and insist upon that nothing but clean and wholesome milk will be accepted in our factory, we must set a good example, not alone for our patrons, but for the entire community. We cannot expect our patrons or compel them to deliver nothing but clean and wholesome milk and manufacture it into cheese in a dirty and unsanitary factory.

The inside as well as the outside of our factory as well as the surroundings must represent a picture of neatness.

Not alone the floors should be kept clean but everything that comes in contact with milk. There is no more excuse for the cheesemaker with small income, than it is for the cheesemaker that has the means, to keep his factory in an unsanitary condition, for water is cheap and some of our world's known washing powder is within reach of everybody. Not even the whey tank must be neglected, for a dirty and filthy whey tank is not only an eye sore but thousands of dollars in losses are sustained in the cheese business annually just for that reason.

Special attention must be given to our weigh room for it is almost impossible to detect a can of tainted milk in a dirty and unsanitary room where the walls are spattered with milk and the corners are filled with dirt.

Keep nothing in your weigh room but a good reliable set of standard scales. Weigh can, composite sample jars arranged on shelves, and your receiving sheet, everything, must represent a picture of taste and neatness.

In receiving milk in the morning greet your patrons with a kind and cheerful good morning, examine every can of milk carefully before accepting it or emptying it into the weigh can. during the time the patron drives away, empty your sample in the composite sample jar so that when the next patron drives up side of the weigh can, then weigh the milk, enter the number of pounds on the receiving sheet and the patron's pass book and during the time the patron drives away, empty your sample in the composite sample jar and when the next patron drives up you will be ready to receive his milk.

By all means give each patron honest, just weight, no more and no less, be honest in all your dealings, take a deep interest in the welfare of your patrons as well as your own and in that way you may not only gain and enjoy the confidence of your patrons but also of the surrounding community.

DISCUSSION.

Mr. Haven: At the receiving stand we find two kinds of milk that give us trouble, some a little too good to make poor cheese and a little too poor to make good cheese.

Mr. Kasper: There is hardly any excuse for poor milk. All milk is good when it comes from the cow and if it receives the porper care it is pretty nearly all alike when it comes to the factory.

Mr. Haven: Don't you receive a lot of milk that is not right and you cannot tell just where the trouble is?

Mr. Kasper: We have had very little trouble the last seven or eight years. We have our patrons so they cool their morning's milk, set their cans in a tub of water and strain their milk into the cans and cool it down.

Mr. Haven: That may be true, but don't you find cases where the milk comes in in such way that off flavors develop later? I find in my work among the patrons that that is the worst thing we have to contend with. The milk develops off flavors later and many times we find milk on the dividing line between good and poor.

Mr. Noyes: I do not know how it is in Mr. Kasper's territory but down in our territory we have some patrons that bring some pretty good milk and when one can of milk is off most of the milk is off, and when one can of milk is good they are all good. Being in the old section of the state, we do not have as good pastures as they do in some parts of the state and the milk in the very hot weather is bound to be off. In my work traveling around in a radius of fifty miles, I do not know of a single factory that has nice milk all the time and I know of very few factories in our territory that during the months of July and August do not have at least one floater, and in one of my father's factories they had thirteen floaters during the month of July, but on the ridge were this factory is located water is scarce and hard to get, they have to go three and four hundred feet for water. Most of the farmers have wind mills and it is impossible for one man to pump enough water to get their milk cool unless he has a gasoline engine and consequently sometimes, when the wind is not blowing, they get very bad milk. In other places, where there is bottom land, the milk comes bad in certain portions of the year and when one can of milk is bad most of it is bad and we have some cheesemakers in that territory who are exceptionally good about advising their patrons in taking care of their milk and I know some of our cheesemakers go out among the farmers and take care of the milk themselves, but the next day would get gassy curd, and the only way they could do was to use a great deal of hot water so as to make good cheese that all dealers would want.

Mr. J. W. Moore: I would like to ask Mr. Noyes what he means by hot water?

Mr. Noyes: In our factory, when we have a very hot night and the milk comes in very gassy we advise water from 125 to 130° F.; when we have bad flavors and very gassy milk we advise using water from 130° to 135° F. and our makers have very good success in making a close boring cheese that will pass the world over. Most of our cheese are shipped south to Texas.

Mr. Schwingel: I would like to ask Mr. Kasper if he really thinks that a cow always gives good milk? I think that among a lot of patrons in a factory you will find some cows will give bad milk, due to the fact that some pastures have stagnant water where the cows will drink and we can smell it in the milk as soon as it comes in in the morning. This is a matter that should be discussed a little more, I think, because some of the bad milk comes directly from the cow.

Mr. Kasper: A man can always tell tainted milk, no matter how well it is cooled. If you get a can of tainted milk well cooled and find the cream swimming on top in small particles, you can make up your mind that milk is tainted. This gentleman over there says that at some times of the year the milk is all bad; we get as good milk in July as we do in September or October. It is the cheesemaker's fault if he takes all bad milk; why does he not send it all home?

Mr. Wallace: Are you bothered with sediment in the bottom of your cans?

Mr. Kasper: No, our strainer cloth is almost as clean after we have taken in the milk as before. When our farmers brought in milk with sediment we used to tell them the best place to leave fertilizer was on the farm.

Mr. Wallace: Are you troubled with flavors in the milk, that is food flavors like cabbage, beets, turnips, or anything of that kind?

Mr. Kasper: We do not allow them to feed cabbage. Sugar beets wlll not affect the milk.

Mr. Wallace: Do you allow them to feed mangels?

Mr. Kasper: Mangels will not affect the milk if fed right after milking and if they are not rotten. I do not think mangels fed in the fall of the year will affect the milk any. I tell you most of the places where milk is spoiled is from feeding stuff that is piled up in the barn, they give off odors in the stable and that is where the milk catches it the most.

Mr. Wallace: It has been my experience in butter that if you have many patrons feeding mangels you can tell it. One or two will not make any difference but where a lot of them feed them you will be troubled with off flavor. It seems to me you are very fortunate in being in a county where you get good milk.

Mr. Kasper: There are not three patrons in my factory that have not swampy land. The patrons let their cows run in the swamps and it is hard for them to produce good milk, but in some way the milk does come in good.

Mr. Wallace: I had a neighbor who claimed he had perfect milk for several years and a year or two ago it went off. He could not tell what the matter was and no one could tell him what was the matter. I was in the same condition myself, my milk went off, and before that I had quite perfect milk. We got sweet flavor and off flavor and we did everything in the world to stop it. I advertised that I would give any man in the state $100 to tell me what was the matter with the milk. The men that had the cleanest places, the best water and the best pastures were the men that brought in the poorest milk and we would get soapy texture, sweet flavor. We thought possibly this off milk was due to aeration so we had them stop aerating and cool their milk down perfectly cold in the cans, but we never improved the milk from start to finish of that season. I am of the opinion that a man can do a whole lot to make good milk but he is not doing it all. There is a certain amount of luck in some of it.

The President: I think we will have to close this discussion just now. Mr. Watrous, of the Business Men's League, has a surprise in store for us.

Mr. Watrous: On the foot of the page of your program it says "A number of speakers, whose names do not appear on the program, have been invited to address the convention during the sessions." That is all right but this invitation has not included me. However, I have got so in the habit of being on your program somewhere that I could not resist the temptation to come over here and say "Hello" to you and tell you that the Business League is glad, as always, to have you with us.

Yesterday you were offered a pleasant change in your program by having a real mayor give you an address of welcome instead of a substitute who has spoken for the mayor for the last two or three years. I know you cheesemakers are all fond of music and the Business League has not sent over here a boquet of flowers but it has sent, as a little token of its appreciation of your being with us, a quartette which has come here to sing for you, if your president will allow us a few minutes to do that and break in on your program, and I have pleasure in introducing to you now the Kilbourne Quartette, which will sing one song for you and if you like that song perhaps will sing two or three.

Selection by the Kilbourne Quartette roundly applauded and two encores were responded to.

The President: As I said a short time ago, Professor Moore is obliged to leave on an early train, and I will therefore call on him at this time to give us a talk on Alfalfa.

ALFALFA.

PROFESSOR R. A. MOORE, Madison, Wis.

Agronomy, Agricultural Experiment Station.

Mr. Chairman, Ladies and Gentlemen:

I am happy to meet the cheesemakers of Wisconsin here this morning and at first when your secretary notified me that he desired me to appear on the program I could hardly see how we were going to bring alfalfa culture into the art of cheese making. This brings me back to my early boyhood days. I remember the time in Wisconsin when the energies of the farmers were devoted to the growing of wheat. We grew wheat from north to south throughout the entire state. We grew wheat until we had an iron clad mortgage on every farm in the state and it was not until great men like Smith of Sheboygan County, and Governor Hoard of Jefferson County, came through our county that we were told of our sins, told that we were taking from the land in growing wheat that which we had no right to do. We were told to go into dairying and as if by magic the whole state of Wisconsin acted as one man and went into the dairy business. In a short period of time the county from which I came was transformed from a wheat growing county into a dairy county, a cheese making county. I remember when there was not a single cheese factory in the county, and in a few years in the small county of Kewaunee we had sixty-eight factories, and it was through the knowledge and effort of such men as we have here today that that county was transformed, that the whole state was transformed, and by those young men putting forth active efforts, through the efforts of the dairy school, through the gain in knowledge in the art of making cheese and starting cheese factories and creameries all over the state that we now have some three thousand creameries and cheese factories all over our state and the dairy products of this state bring to the farmers annually something like fifty million dollars. What has that to do with the growing of alfalfa?

SEEDING, GROWING AND CURING.

No forage crop has been given more attention in the United States during the past ten years than alfalfa, and while it is in the experimental stage in some parts of Wisconsin, yet where proper precautions are taken it can be grown with a reasonable degree of success on any of our older and well cultivated farms.

Wisconsin is a great dairy state and the milk products bring to our farmers annually some fifty million dollars. A considerable portion of this money is expended for high protein feeds in the form of oil meal, oil cake, cotton seed meal, bran, etc. These high protein feeds are purchased for balancing the feed ration, and often the farmer has to draw the feeds from the railroad station several miles away, after paying an exceedingly good price for them. Considering the time expended in carting the feeds, together with the general cost of them, makes it expensive for the farmer and takes from him a large portion of what would otherwise be profit.

Alfalfa has come to Wisconsin to supply the dairymen and stockmen of the state and save for them a large portion of the money annually expended for high protein feeds. For seven years alfalfa has been grown with a reasonable degree of success on the Station Farm near Madison, and many tests made to determine the best method of growing this important forage plant under different conditions of soil and climate.

The value of alfalfa as a feed for all farm animals including swin cand poultry is so well known that it is unnecessary to speak of its merits here. No single forage plant combines the materials for a profitable ration for dairy cows, sheep and brood sows so well as alfalfa. When grown in comparison with red clover, timothy and brome grass on the Station Farm the season of 1905 the yield per acre of hay was 5.4 tons for alfalfa; 2.5 tons for clover; 2.3 tons for timothy, and 1.3 tons for brome grass. As a green forage the weight of alfalfa grown per acre was double that of clover, three times the weight of timothy and five times the weight of brome grass. The per cent of protein found in the hay was as follows: 18.7 for alfalfa; 13.28 for clover; 4.74 for timothy, and 6.07 for brome grass. In total yield of protein per acre alfalfa gave a yield of three times that of clover, nine times that of timothy and twelve times that of brome grass.

Several hundred members of the Wisconsin Experiment Association have cooperated, thus making it possible to get data bearing upon the subject from many counties of the state under widely different conditions. The purpose of this paper is to state briefly the information gained with the hope that it will be beneficial to those desiring to grow alfalfa.

Testing the seed. Several factors enter into the successful growing of alfalfa, but none are more important than testing the seed and success or failure will be largely determined by this factor. Before placing an order for seed a sample should be secured from each of several good seed houses and germination and purity tests made. Often seed that looks good will give a low test. Seed that shows a germination test below eighty per cent should be regarded with suspicion. Its vigor is seriously impared even though it may sprout.

A simple tin plate tester can be used for the test in which are placed cotton flannel pads cut to fit the inside of the plate. The pads are soaked in water and excessive moisture removed by squeezing. Lay the first pad in the larger of the tin plates used and sprinkle 100 seeds on the pad,—put the other pad on top of the seed and then cover with the smaller plate to retain moisture. Plates should be placed at ordinary room temperature and examined at intervals of twenty-four hours. If pads dry out sprinkle them with water. If seed is of high vitality at the end of four days, fine vigorous sprouts will be noticeable. The sprouted seed should be removed at the end of the fourth day and the unsprouted seed left at least two days longer. The germinating power is expressed in per cent. If the alfalfa seed appears to be filled with foreign seeds it is well to send the sample to the Agronomist, Wisconsin Experiment Station, Madison, with request to test for purity. The test will be made free for any resident of Wisconsin.

Locating the field. Good growths of alfalfa are often secured in favorable seasons on level land but better results will be obtained by selecting the field on land that is somewhat sloping where water will not stand during any portion of the year. On level ground during sleet storms water is apt to collect in all the depressions forming and freezing an ice sheet which smothers many of the alfalfa plants. "Patchy fields" are hard to renew and the best practice to follow is to plow the entire field and reseed. In no case should alfalfa be sown on land that is subject to overflow or where the water level is but two or three feet below the surface.

Character of soil. Alfalfa will grow on a wide variation of soil ranging from a rich sandy loam to a heavy clay, but a rich clay loam over a gravelly sub-soil seems to be best. It is practically useless to try to grow alfalfa on sandy or "worn out" soils without an abundant supply of good barnyard manure. Alfalfa will not do well on new and unsubdued soil, but develops best on the well, cultivated soils.

Soil inoculation. Alfalfa belongs to the plant family known as leguminosae. Like our common red and white clovers it has the power through minute living organisms found in the little nodules on the roots, to take the free nitrogen from the air for the purpose of building much of its plant tissue. Largely for this reason the plant is exceedingly high in nitrogen content and receives the greater portion of that valuable constituent from the air instead of the ground. These little organisms or bacteria are necessary for the successful growing of good crops of alfalfa and where the soil contains them in limited numbers only the alfalfa plants soon wither and die. In some sections of the state the ground is sufficiently supplied with the alfalfa bacteria, but there are many localities where they are present in so limited a number that it seems impossible to get a catch of alfalfa that will succeed in surviving the first winter.

The ordinary roadside weed, the sweet clover, which naturally grows to the height of five or six feet throughout nearly all of the counties in southern Wisconsin, is one of the essential bacteria distributors. Notwithstanding the fact that farmers have waged war upon sweet clover for nearly a generation, this plant thrives readily and is of great importance in furnishing the necessary bacteria, for the successful growing of alfalfa. When a farmer is in doubt as to whether or not his land contains the proper bacteria he can successfully inoculate his fields by scattering soil from an old alfalfa field or where sweet clover has grown. Two tons of earth per acre should be scattered after the seed bed has been prepared, if earth can be secured near at hand, immediately preceding the sowing of the alfalfa seed. The alfalfa responds readily to this method of inoculation and nearly all plants will be found to have the proper nodules on the roots the first season of growth.

An excellent plan for supplying the soil with the proper germs is to use a mixture of one-fourth alfalfa seed and three-fourths clover seed for general seeding. The clover hay will be of a better grade where alfalfa is grown in connection therewith. The alfalfa plants that survive become bacteria distributors so that when the desire in later years is to seed down to alfalfa, the soil will be found amply provided with the proper germs.

Some seedsmen have advertised organisms to insure good crops when the seed previous to sowing is treated with a solution made from these cultures. The results obtained indicate that much more certain results can be secured by the addition of the infected soil.

Soil preparation. Good results have been obtained on both fall and spring plowed lands depending upon the texture of the soil and freedom from weeds. If fall plowing is resorted to it is well to plow early in the season, so as to cover weeds before they produce seed. Double disc both ways in the spring as soon as the land works well and put in garden condition, using in addition to disc fine tooth harrow. The ground should be heavily spread with well-rotted manure, using from 10 to 20 tons per acre. If seeding is done in spring plowed land the ground should be heavily manured during the winter and plowed as soon as the ground works well in the spring. The fine tooth harrow should be run over the plowed field within a few hours after the furrows are turned to prevent the drying and hardening of the soil. If the soil once becomes lumpy it is hard to put in proper condition for alfalfa seeding. A planker or roller should be used immediately before and after seeding to alfalfa, which aids very much in firming the soil to enable rapid germination of the seed. Best results have been obtained in Wisconsin by sowing as soon as the ground can be worked to good advantage.

Nurse Crop. Where ground is inclined to be weedy it is preferable to use a nurse crop to assist the alfalfa in keeping down the weeds until it becomes established. Barley used at the rate of three pecks per acre has given best results as a nurse crop and can usually be left to ripen without apparent injury to the alfalfa. If oats are used do not exceed one bushel of seed per acre and if the season is dry cut the oats for hay at the time of heading.

Thin seeding of the nurse crop is important as it gives the small alfalfa plants sufficient space to grow between the grain plants without crowding. It also prevents to a great degree the lodging of the grain crop which will invariably kill the alfalfa plants. The draft of moisture and fertility from the land is not so great where a thin nurse crop is used in preference to thick seeding.

Land on which tobacco, sugar beets, or any highly cultivated crop has been grown the preceding year can be seeded to alfalfa without a nurse crop with fair chances of getting a good thick stand. Where alfalfa is seeded without a nurse crop the ground should be cultivated with disc and fine tooth harrow until May 15th or June 1. Weeds will then have been quite thoroughly killed and the ground will be in fine condition to sprout the alfalfa seeds in the shortest possible time. Where a nurse crop is not used frequently a cutting of alfalfa can be secured by September 1. Sowing with a nurse crop is most generally practiced in Wisconsin as it enables the farmer to get a stand of alfalfa and a fair grain crop the year of seeding.

The alfalfa seed should be sown at the rate of at least twenty pounds of good seed per acre. Five pounds of seed extra per acre will usually yield enough finer and better quality of hay to amply repay. Alfalfa is a perennial plant and will grow for many years without reseeding.

Machinery for seeding. A drill or broadcast seeder with grass seeder attachment is the most convenient machine for seeding, as both the nurse crop and the alfalfa seed can be sown at one operation. The cahoon whirling grass seeder and the wheelbarrow seeder are also used to advantage. Sowing by hand is often resorted to where the area is limited.

Cutting the Crop. Where alfalfa is sown as above described no hay crop can be expected the first season except under the most favorable conditions. In no event should the alfalfa be cut or clipped after September 1. If the growth of alfalfa is sufficient to warrant taking a crop from the land by September 1, it should be cut then regardless of the cutting stage.

The year following the seeding you may reasonably expect three good crops. Your first crop will be ready for cutting the early part of June, at a trying time in the season for curing alfalfa. Cut at a time when blossoms appear on about one-tenth of the plants and on the morning after the dew has disappeared on a day that promises fair weather. Adjust the cutter bar of the mower so that the stubble left will be at least one inch in height. This will prevent injury to root buds of the alfalfa plants. In the afternoon of the same day of cutting if weather has been favorable the alfalfa can be raked and put into small cocks.

Hay caps. A much better quality of hay will be secured if the crop is covered under hay caps than in open cocks or windrows. Caps can be made from light cotton duck by hemming the edges to prevent raveling. Eyelets should be made in the corners in which strings should be tied to fasten the caps. Heavy wire cut eighteen inches in length and a loop made at top in which to tie string attached to cap makes a convenient arrangement to hold the caps in place. The wire pegs can be either run into the ground or pushed into the sides of the cocks of alfalfa.

Ex-Governor Hoard recommends horse shoe attachment for strings. To make these cut old horse shoes at toe calk making two weights of each shoe. Punch holes through shoe about two inches back from the end where cut so that the short end of shoe will stick into the hay and thus hold the cap in place. Some make little sacks or pockets in each corner of the cap and fill with gravel or stone for cap weights.

Curing alfalfa. The cocks of hay should not be left standing in the field more than two or three days without being removed, or the alfalfa plants underneath the cock will be completely smothered. By taking a pitchfork and running it into the cock of alfalfa near the bottom on the side in the direction the cock is to be moved one can easily pull the alfalfa from the place previousy occupied. If alfalfa is exceedingly green when cocked or rainy weather sets in it will "heat" the cock unless opened every day or two. After rainy weather the cocks of alfalfa should be opened and the hay aired for a few hours and then recocked. In favorable weather no more difficulty will be experienced in curing alfalfa than in curing heavy growths of clover. Like clover the leaves are rich in nitrogen and crop off readily when dry, therefor the aim of the farmer should be to cure the alfalfa with the least possible handling. One-half of the feeding value may be lost through the weathering and improper handling of the crop.

Alfalfa is either stacked or placed in a barn after curing. Considerable of the feeding value is lost through stacking as the hay is porous and rain penetrates the stacks to the extent of two or three feet. An outside mow with roof does fairly well and little of the alfalfa is lost when stored under cover. A covering of marsh hay or a tarpaulin will prevent damaging of alfalfa in the stack. When to be put in barns it is well to let the alfalfa "sweat" in the cock, otherwise it will heat and get musty in the barn.

This great amount of valuable forage taken from a limited acreage had led many to think that a large portion of the farm should be sown to this important crop regardless of conditions. A word of caution to farmers who have never grown alfalfa is necessary. Try only a limited acreage on the start, not more than one or two acres, for the purpose of studying the plant and the soil conditions of the farm. The longer alfalfa is grown and fed upon the farm the more ideal the conditions for successful growth become and we feel the day is not far distant when alfalfa will be grown on the older farms of Wisconsin as generally as our common red clover.

DISCUSSION.

Mr. Reid: Why do you wait until the dew is off before starting to mow?

Prof. Moore: So there will not be too much surface water in the plant. You can take care of the inside juice in the plant nicely and the dew will dry off more readily if it is left standing in the field, so we wait until the dew is off so as to have as much foreign moisture off it as possible.

Mr. Reid: Is there any other reason? If you mow it when wet the heavy wheel will kill the plant.

Prof. Moore: If the ground is moist and the wheels go down they crush the little bulbs and wherever those are crushed the plant is going to die.

Mr. Scott: By putting alfalfa in a silo is the feeding quality affected any?

Prof. Moore: The only difficulty we find in siloing the plant is it is pretty high in nitrogen and it takes on a pretty heavy odor. That is true also of the siloing of soy beans, but by putting in a combination of alfalfa and corn I can see how you can get a very desirable ensilage and people have succeeded fairly well in putting alfalfa into the silo as it is.

Member: How does alfalfa grow on sandy soil?

Prof. Moore: We like a rather rich soil. If the sand is rich it is all right but if you are going to try in sandy soil, I advise to heavily manure, put on from ten to twenty loads of manure to the acre. That may seem an excessive amount but when you consider that you cut from three to four cuttings of hay and are getting probably $100 worth of forage from a single acre, you do not need to grow a large acreage in order to get a great amount of feed as far as value is concerned.

Mr. Doane: The Lake Shore country probably represents the sandy districts of the state. Do you know of successful fields of alfalfa from here North, within twenty-five or thirty miles of Lake Michigan? Do they have trouble in growing it?

Prof. Moore: Yes Sir. We find along the Lake Shore we have cold breezes from the lake; the land will heat up during the day and then a cold breeze from the lake will set in at night. The land will heat up during the day and then the cold breezes set in from the lake and often bring in fog and they have trouble with first cuttings but they appear to have little trouble with the later cuttings. I was surprised a few years ago to see some beautiful fields of alfalfa growing on heavy clay farms.

Mr. J. G. Moore: Is it not a good plan on sandy soil where alfalfa will not catch to sow sweet clover, the same as grows along the road?

Prof. Moore: Certainly that would be a good plan because you would get the proper germs in the soil. Sweet clover belongs to the same specie, in a way, as alfalfa.

Member: How do you think it would grow in Iowa County?

Prof. Moore: I would not advise putting it on low flat land. On rolling land it would be all right. We know there are times in the winter when there is a little snow on the ground and we have one or two days of warm weather and this snow melts down, and in the low lands the little depressions will be filled with water, then if the weather turns cold the little depressions will be coated over with ice and the plants under the ice will be smothered.

Member: How would red clay loam do?

Prof. Moore: It is very good, especially if you have gravelly sub soil.

Mr. Corneilson: I understand there is a method of inoculating the seed. Has that been successful in distributing proper germs?

Prof. Moore: It has not been successful. We have carried on extensive experiments at the station farm to see whether or not it would be practical. We believe in the theory, the theory is all right but it is not practical. We have tried it on several different kinds of legumes; we have got culture from the government, from the Nitro Culture Company and from Canada and have not succeeded to any great extent by inoculating the soil in that way. The ground method is more sure.

Member: Would you not prefer dry alfalfa to feed with ensilage than to put it in with the silage?

Prof. Moore: I think to cut alfalfa green and put it in with corn silage would be exceedingly fine.

Mr. Westphal: What would be the proportion of protein in alfalfa compared with red clover?

Prof. Moore: Red clover has a little over two-thirds as much protein as alfalfa but where you get three times as much alfalfa as clover, you can see the difference in favor of the yield of alfalfa, but red clover is a wonderful plant and we do not want to go back on it.

The President: We will have to close this discussion. We have had a very good address by the professor and now we will take up the next lesson by H. A. Chaplin, of Plymouth, Wisconsin.

PREPARING STARTERS AND RIPENING THE MILK.

H. A. Chaplin, Plymouth, Wis.

Mr. President, Ladies and Gentlemen:

The subject assigned to me—that of preparation of starter and ripening of milk is one of the most important points in cheese making. Before stating how we prepare the starter, I wish to carry you back to the time I first made cheese in '78 and '79 and to the process in practice then and several years thereafter. We knew nothing of starters. The milk was taken in in the morning, being heated at the same time as quickly as possible to 84° or 86° according as to whether we were using prepared rennet or rennet extract. The milk was therefor set by or before 8 o'clock in the morning and heated to 98 or 100° by or before 10 o'clock. Then we waited for acid. If the milk came in in the proper condition, i. e. wth the proper degree of ripeness, it worked right along—we gained acid in the right time, and finished cheese making much as we do to-day. If the milk arrived too sweet we waited for acid from 2 to 4 or sometimes even 6 hours from the time of heating to the drawing of the whey. In that case we thought there was something wrong with the milk and complained to the farmers, they took better care of it, cooled it a little more, and the milk came in sweeter than ever. And where the curd laid so long in the whey, it became whey soaked, and it was impossible to make as fine a quality of cheese from it. I do not mean to say that we did not make as fine cheese in those days, because I think we did, but it was harder work—required more skill and much more patience.

About this time we began to ripen the milk in the vat, using Harris test, and later Monrad, and still later Marschall to determine the degree of ripeness, to hasten the process of ripening we find some of the boys using whey starter—putting in sour whey to ripen the milk. Of course this had the desired effect in hurrying the work, but almost invariably made a poor quality of cheese, because all the taints and poor qualities of each day were carried along to the next, and added to those of that day—the starter becoming worse from day to day.

To overcome this a whole milk starter was used which worked better, and was taken up, and advertised, and taught as a great cure-all ills that milk was heir to; but I firmly believe that in the first few years that starters were used, more cheese were spoiled by use of poor starters, or excessive use of good ones, than were helped by them, but I am glad to say that the tendency of the present time is toward placing starters where they belong—not as a cure-all, but for the purpose of making a better and more uniform quality of cheese. I want to caution the boys against excessive use of starters—a starter is not for the purpose of hurrying up the work so that the boys can get through earlier, go to the ball-game, or to see somebody-else's sister. We never use more than ½ of 1% of starter during the spring and summer, and not more than ¾ of 1% during the late fall, except it be where the milk is known or expected to be tainted.

In preparing starters we used to take the milk from the vat, and this was improved upon by taking out the milk from some farmer considered to have good milk, and carrying that from day to day by addition of a little sour milk of starter. This practice is used by some of the makers today, and with good success during most of the year, but there are certain times when the milk of the best farmer may be badly tainted, and still while cold at the intake the maker not be able to detect it. Then the starter will be very bad, and either have to be destroyed and leave the maker without a starter, or be liable to spoil the whole milk in the vat. Therefore most of us are using a pasteurized starter. We prepare the starteline by using commercial lactic ferment, prepared according to directions (we use Hansen's, because it is handled at our dealer's, although I have tried other lactic ferments, and found them equally good).

In preparing the milk for the starter, we take the milk from some farmer whose milk is not over-ripe, and appears clean and good. We do not take it from the vat for the reason that it might be slightly over-ripe, and not stand heating properly. The milk is then placed in the pasteurizing tank, and kept there in cool water until we have time and plenty of steam to use, when the steam is turned on, and the milk heated to from 170 to 180 degrees F., held at that temperature about ½ an hour. As our factory is piped with cold water, to cool it we have only to turn a valve, let the cold water run in on one side, warm water overflowing on the other side into the drain, or if necessary (as is generally the case) to the whey tank. We cool the milk as quickly as possible to from 65 to 70 degrees according to the season and the weather. Sometimes in hot weather it is necessary, in order to keep it at the right temperature, to leave the cold water running slightly all night. Then at from 2 to 6 o'clock, according to the season of the year and the condition of the weather, the starteline is incorporated with the starter, at such a time as we have found by experience that the starter will be in the best condition in the morning when ready for use, i. e. neither too sour nor too sweet. I like it best thick, but not so thick but that it will stir up smoothly at about the consistency of good, thick cream. Not all of you can do it in the same way, because not all factories are equipped with steam and running water, but the same effect can be produced with a little more labor, even where it is necessary to heat the can of milk for the starter in a boiler on a stove, and cool it in a wash tub, and will be better than any starter prepared without pasteurization.

We are very particular in saving the starteline from day to day. Our starteline is kept in a 2 qt. can with a tight cover, so that it can not be contaminated by the air, and even then the top is always poured into one can and the bottom into the next, out of which second can the starteline for the next day is taken, and the starteline is taken from the bottom of this second can, and immediately placed in the ice-box, and even then the starter will sometimes go off, probably caused by becoming too sour or by some accident. Upon the slightest sign of the starter's not being perfect we prepare another starteline from fresh lactic ferment, but don't destroy the old starteline immediately, because we have found the lactic ferment not always to be relied on.

We mix the starter with the milk running into the vat at such a time between the first and last milk going into the vat as will in our judgment bring the whole milk in the vat nearest to the proper degree of ripeness by the time we are ready to set the milk. As soon as the milk is heated to 86 degrees we test it to see how ripe it is. If it works as we have figured it, it wll show from 16 to 18 points on the acidimeter, according to the season of the year and the purity of the milk. If it does not, the milk is left to stand, (being stirred meanwhile until it will. To determne the degree of ripeness we want, we bring it to the point where it will be ready to place the curd on the rack in from 1¾ to 2 hours from the time of setting the milk, with an acidimeter test of from 14 to 16 points. This is the key to the ripening of the milk. Not all can use the same degree of ripeness because not all milk works alike, but this is the point which in our judgment works best with us.

You will notice that we leave a good many things to our judgment. There is no fast and solid rule in cheese-making. If there were there would be no need of dairy schools and expert cheese-makers. We could hire anybody, give him a set of printed rules and a watch, and expect him to make good cheese. Instead of that, we must study our milk and grasses, and know the effects of different pasturage on milk. And again I want to caution you against the use of too much starter—time is always with us. If the milk is not ripe enough, we can always wait for it, but if it is too ripe, it is hard work to make a uniform cheese out of the milk. We are making cheese for the American people, and they are a very particular people—they will eat a good many kinds of cheese, but they draw the line at sours.

DISCUSSION.

Mr. Kasper: At what time do you add your starter to the milk?

Mr Chaplin: It depends on the time of year. If I think it is necessary I put it in the first thing in the morning. If I find it has been workng the best that way, I wait until the milk is mostly in the vat. I always put it in so it will be at the right degree of ripeness when I get ready to use it.

Member: When do you add starteline to the pasteurized milk?

Mr. Chaplin: At two to six o'clock in the afternoon, but during the greater portion of the year at 2 o'clock.

Mr. J. W. Moore: Is it advisable for a cheesemaker to let the testing of his vat for acidity go until his milk is heated to 86 degrees? It seems to me if a maker has any trouble, or if he is suspicious of his milk being over-ripe he can find that out in time to use a starter, and the starter should be used before the milk is heated, but if he does not test the ripeness until he gets his milk heated that is nearly the time he is ready to start cheese making.

Mr. Chaplin: As a rule we do not have trouble with our milk. If we are suspicious of it we test our milk for acidity.

Mr. Hackert: How long do you carry your starter?

Mr. Chaplin: I have carried some starters for some time, and I have found starters I could not carry one week.

Member: Do you generally take your starter out of some patron's morning milk?

Mr. Chaplin: I do not think that is necessary; I simply have milk that is sweet.

Mr. Aderhold: How many years have you used starter?

Mr. Chaplin: About eight years, nearly half the time I have been making cheese.

Mr. Aderhold: You made the statement that when you first began to use starter a great deal of trouble was caused by using too much starter and using poor starter. Don't you think where they use the raw milk starter, as I think most of the boys do today, that they more often use a poor starter than a good one.

Mr. Chaplin: No I think some of them in our county, where the milk generally comes in good, can make a pretty fair starter without pasteurization.

Mr. Aderhold: They can but it is generally not as good as they like to have it.

Mr. Chaplin: Not as good as a pasteurized starter but that does not obviate the fact that most of them use too much starter.

Mr. Aderhold: In traveling from one factory to another, I find that where raw milk starter is used, in nine cases out of ten, at least the day I was at the factory, the starter was not just as the maker wanted to have it. Sometimes it was not starter, sometimes the whey was standing on it, sometimes it was tainted, and I have found it that way nine times out of ten in my travels throughout the state from factory to factory. There may be some cheesemakers that get it pretty nearly the same every time but the starter should determine to a considerable extent, at least, the flavor of the cheese and I do not think we ought to take anv chances on making it from something we do not know anything about and have no control over. I believe of a cheesemaker wants to be an ordinary "dump" he can show it as good as in any other way by using raw milk starter but anybody that wants to make something excellent is not going to be dealing with a starter over which he has no control and that he knows nothing about how it is going to come out.

Mr. Chaplin: I am not as strong as Mr. Aderhold on the point he makes regarding the raw milk starter. I think the greatest trouble is that once in a while a raw milk starter will spoil a batch of cheese, and that once in a while will more than pay for the extra work of pasteurizing.

Mr. Dassow: Don't you think it better to use less starter and put it in early in the morning rather than wait until later in the day and put in more?

Mr. Chaplin: Yes, where you are fairly sure of your milk. Where it has been working right along as you want it to. I should put in my starter early in the morning and use as small a quantity as possible.

Mr. J. W. Moore: I believe it was said by some one yesterday that it was not important to select the milk from which starter was made. Lots of us do not pasteurize this starter as we should, and we call everything sterile. Why not select the best milk, then if we do not pasteurize thoroughly we will have something better?

Mr. Chaplin: Time comes into consideration there. You may not have the best milk in the factory coming in until after our vats are washed and ready to receive the starter next day. I admit we should select starter from fairly good milk. If your milk is not bad I think pasteurization will kill all the germs in it.

Prof Moore: You admit the milk should be selected?

Mr. Chaplin: Yes from selected milk.

The President: The next subject to be discussed is Setting, Cutting and Cooking of the Vat by Mr. P. E. Cranston, of Sabin, Wis. I understand Mr. Cranston is not present so we will discuss the subject and I will call on Mr. H. J. Noyes to open the discussion.

SETTING, CUTTING AND COOKING OF THE VAT.

Discussion led by H. J. Noyes, Muscoda, Wis.

Mr. Chairman, Gentlemen of the Convention:

This is quite an important topic but I do not think it should require a great deal of time to bring out all that is necessary in regard to the matter.

The cutting of the vat should be done at the proper time, as soon as the curd becomes firm enough, you can tell this by inserting the finger at an angle of 45 degrees to see if it will break clearly. I think it should be cut as soon as it will break nicely. In cutting your knives should be sharp. It should be cut as straight and swiftly as you can and not wabble your knife too much to break the curd. I would cut with a horizontal knife first, then a perpendicular, then across, and continue cutting until you have the right size granule. If the milk is pretty ripe I would cut finer, but if it is working normal I would cut coarser.

The cooking of the vat. I merely mention these things and you can draw out what you want by discussion. The cooking of the vat depends on the condition of the milk. If the milk is working normally, I would take thirty to thirty-five perhaps forty minutes in cooking. I would rake it over carefully and start the white whey as slowly as possible. If you have milk that is over-ripe you will have to hasten this cooking so as to keep ahead of the acid. You must be governed altogether by the condition of the milk. You have to use judgment in cheese making. You cannot put down a set of rules and go ahead and make cheese. You must use your head, your brains and your eyes.

I do not know but that is enough for me to say on the subject, Mr. President.

The President: I would like to hear from Mr. Aderhold whether he agrees with all Mr. Noyes has said.

Mr. Aderhold: I agree with everything he said that was the truth.

The President: Has anyone any questions to ask?

Mr. Parkin: In cutting the curd, what size cubes do you prefer for a normal working curd?

Mr. Noyes: Perhaps a quarter of an inch cubes and sometimes, even though milk is working entirely normal, we have to cut a little finer than at other times in order to get the proper cook. I would raise the heat gradually in order to get a good cook; I would not push the heat up and cook the curd on the outside and congeal the moisture in the curd. The temperature should be brought up slowly so as to cook the curd nicely all the way through.

Mr. Haven: What is your choice of setting for normally working milk and also gassy milk?

Mr. Noyes· In most any case I would keep pretty close to 86. I have set milk at 88 and worked it along there nearly a season but you need very sharp knives and very skilled action in order to do it. I think near 86 in any case is the best point to set milk at.

Mr. Haven: In Michigan we have been setting it at 86. Last winter we had at our convention an outside speaker from Canada who advised setting at 82 and taking an hour and a half to cook.

Mr. J. W. Moore: Do you mean that the cubes should be cut as fine as a quarter of an inch in normal working milk? Is that not exceedingly fine? Are not the knives half inch? Do you advocate cuttng finer than a half inch?

Mr. Noyes: We have not found it just right, but I advocate a quarter of an inch. In that case you never get exactly a uniform curd.

Mr. Moore: Don't you think it importannt to get a uniform curd? What reason have you for working your curd in a way that it should be cut as fine as a quarter of an inch curd?

Mr. Noyes: One of the greatest points is in getting a good cook. I found most of the men I employed would get the acid pretty readily but when I find a man who understands a good cook, ninety-eight times out of a hundred he is a good cheesemaker.

Mr. Moore: With a curd that stays two hours in the whey and gets reasonably firm if the cubes are a half inch, in case they are a quarter inch how much will that reduce the time?

Mr. Noyes: Quite a little. It gets it out of the way a little sooner, especially in summer when you have all kinds of milk I think the sooner you can get a good cook the better. I do not advocate rushing the curds, understand.

Mr. Moore: We are talking about normal curd, one that we could leave in the whey as long as we thought advisable to leave in regardless of gas. If you work it much faster than two hours in the whey will you not have excessive loss of fat in the whey by cooking so fast?

Mr. Noyes: I would not cook it fast. In cooking the curds fast if you take the particles and break them apart you will find the inside of those curd cubes soft and mushy. When you handle those you get a lot of butter fat out, you get out a lot of white whey. If you cut finer and cook a little slower you get better results.

Mr. J. W. Moore: If you cut a curd more than twice with vertical knives you cannot cut it uniform and you will have some fine curd particles that are all right and others soft, then you will hear some makers say "My milk is not working right; that curd was firm in the whey but when it came off it leaked on the racks. Why did it do that?" There were some cubes there that were harsh and dry, others that were large and soft and when they were put on the racks they broke open and leaked. Of course that is an extreme case.

Mr. Noyes: I was never able to run a factory in the summer time and cut but twice with a vertical knife, taking a normal working curd.

Mr. Moore: Do you advocate using a quarter inch knife or cutting several times with a half inch?

Mr. Noyes: I prefer a finer knife.

Mr. Moore: In our experimental work we used a half inch knife and got a three eighths inch knife made, and there is a great difference in cutting with a three eighths inch knife.

Mr. Noyes: You must understand that you cannot compare experimental work with factory work.

Mr. Bruhn: How soon do you turn on the steam after you have the curd cut?

Mr. Noyes: Four or five or six minutes, let the whey get motion through the curd long enough so it will brighten up and be transparent in color.

Mr. Parkin: How long do you take to raise the temperature?

Mr. Noyes: About forty minutes.

Mr. Bruhn: Do you not get a better cook by setting at a low temperature than at a high. What was the object of setting at 88 when you did?

Mr. Noyes: Simply because I was making a peculiar kind of cheese.

The President: We will now stand adjourned until 1:30 o'clock this afternoon.

THURSDAY AFTERNOON SESSION.

Meeting called to order at 1:30 P. M., President Michels in the Chair.

The President: The first on the program this afternoon is a paper by Mr. Casper Stollenwerk.

DRAWING OFF THE WHEY AND HANDLING OF THE CURD.

CASPER STOLLENWERK, Medford, Wis.

Mr. Chairman, Ladies and Gentlemen: It is with great pleasure that I am here with you and hope to meet you all in many more conventions.

The subject assigned to me by your worthy Secretary is the Drawing off the Whey and Handling of the Curd.

Before drawing the whey we take it for granted that the curd has the proper cook and the right amount of acid. The finest and most difficult point in the making of Cheddar cheese is to get the proper firmness and the right amount of acid to come together.

When ready to draw the whey it is very important that the racks and rack cloths are in readiness. The curd should be kept well stirred to prevent it from matting at the bottom. Draw the whey down as much as you can before tilting the vat. When tilted the vat should be about eight inches higher at the upper than at the lower end. As soon as the vat is blocked the curd should be pushed down toward the lower end. The first section of rack should now be put in the upper end of the vat and covered with the rack cloth. Next take the curd pail and dip enough curd on so as to have the layer about six inches deep when stirred and leveled. This process is continued until all the racks are in place and the curd placed upon them.

As soon as the curd is matted enough to be handled without breaking, it should be cut into blocks, turned and again allowed to drain. To keep the temperature and hasten the maturing we usually pile and repile the curd from three to five layers deep. Care must be taken not to pile and mat the curd too much, as this has a tendency to produce a weak bodied cheese. During this time it is necessary that the temperature is kept up near 100 degrees F.

When the curd tears like the cooked meat of a chicken's breast and has developed from one half to three quarters of an inch of acid it is then ready for the mill.

To handle gassy or tainted curds as well as a curd with an insufficient cook or too much acid, it is usually necessary to rinse the curd on the racks before allowing same to mat. The water used should be about 105 degrees F. and the curd must be well stirred when put on. This method of washing curds will wash out some of the taints and acid and get the curd firmer by expelling more moisture.

Should the curd have too much acid or an insufficient cook at the time of drawing the whey, it is necessary that the curd be stirred more. This can be best done by continued stirstirring. At this time, however, it often becomes necessary to attend to getting out the last whey and to free the lower end of the vat from particles of curd. By attending to this the curd has a chance to mat, but should be broken again as quickly as possible. On a curd of this kind I would recommend not to have the curd more than four inches deep when leveled on the racks.

Should the curd get too much cook before the development of sufficient acid it may need but little and at times no stirring. Getting the curd too firm before drawing the whey is usually the cause of a corky or a tough texture in cheese.

The President: Have you any questions to ask Mr. Stollenwerk regarding this subject? If you have no questions to ask we will pass on to the next topic, a paper by Mr. William Winder, of Richland Center.

MILLING OR GRINDING AND SALTING OF THE CURD.

WM. WINDER, Richland Center, Wis.

The topic assigned to me by the secretary is, The Milling or Grinding and Salting of the Curd. To be properly understood, I wish to say, that the few remarks I have to make, are in reference to the making of summer cheese, as the bulk of our cheese is made during the warm months.

The cheese I aim at making is of firm close body and fat meaty texture, one that will cure or break down reasonably quick, and yet have good keeping qualities and improve with age when kept at proper temperatures, up to the age of several months. Cheese of this kind will I believe give general satisfaction to the majority of consumers.

If the curd has been well cooked and put on the racks in a curd sink with the right amount of acidity and stirred sufficiently to remove the moisture to the proper degree and properly turned and matted, I would expect to find it in condition for milling in one and one-half to two hours after removing it from the whey. It should be close and flaky in texture and have an acidity of .75%, or if the hot iron is used, a string of one and one-half to two inches. If the curd has been properly handled, the close flaky condition desirable at milling and the proper acidity should be attained in about the same length of time. Having these conditions I would mill immediately using a mill that would cut the curd into uniform pieces. A good mill should not bruise or smash the curd, but make a smooth clean cut and leave the curd in pieces of uniform size. It should also be easily and quickly cleaned. After milling the curd it should be well stirred so as to keep the pieces from sticking or matting together. In hot weather I would not cover the curd, but keep well stirred and exposed to the air. Keep the curd at a depth of five or six inches. If the curd has been properly handled from the beginning, high piling will not be necessary. Stir through it often enough to keep loose and free from matting. In about two hours after milling if the curd has been made from clean good flavored milk, it should be about ready for the salt.

It should have a nice mellow meaty texture, not soft but close and firm and should have a clean nutty flavor and the fresh butter flavor should be quite perceptible to the smell. If you have these conditions and the drippings from the curd show 1 to 1.2 per cent acidity it would do to salt. I do not practice washing or rinsing the curd. If a curd contains excessive loose white whey and fat, rinsing with a few pails of water before salting would be beneficial. I try to have the curd cooled down to 80 degrees or lower before salting. Now right here before we salt the curd, be sure it is ready and if you are not in a great hurry to get through it is time well spent to wait fifteen minutes longer. I have done it and I believe the majority of cheese makers have, that is to salt as soon as the curd will do. We may get a fair cheese, one that the buyer will not reject, but one-half hour longer before salting and the cheese would be classed as "finest."

In salting use a reliable brand of cheese salt, one of even grain and not too fine. Use two to two and one-half pounds of salt per one thousand pounds of milk. It may be necessary to vary this amount at different times and under unusual conditions. In determining the amount of salt to use, the maker must be governed by his past experience and good judgment. When ready to salt spread the curd out evenly over the vat or sink and apply one-half of the salt, spreading it evenly over the curd and stir through once and then apply the balance and stir several times to be sure of an even distribution of the salt. Pile the curd somewhat deeper and leave for a few minutes and turn again piling deeper. As soon as the salt has thoroughly dissolved and the curd again feels smooth and velvety, stir through once more and it is then ready for the hoop.

No hard and fast rules can be put down for the milling and salting of a curd. Experience and good judgment must rule.

DISCUSSION.

Member: What is the disadvantage in using fine salt?

Mr. Winder: As to the quality of the cheese I do not know that there would be any disadvantage if the salt was good and pure but you would have to use more salt as a larger proportion of it would pass off in the brine. My idea is that the curd would not absorb as much of the fine grain salt.

Member: Why are you anxious to cool the curd to 80 degrees before salting?

Mr. Winder: I find in my experience in salting that you would have to cool it down before putting it in the press and you do not get good results by putting it in the press at a higher temperature, you are more inclined to get huffy cheese and lose more butter fat by putting it to press warm.

Mr. Bruhn: How do you manage to cool down to 80 degrees with room temperature of 96?

Mr. Winder. I do not believe I said I always get it cooled to 80 degrees. I said I tried to. In very hot weather you cannot get it that cool. You may cool your curd by rinsing with cold water. As I said I do not practice it although I did not say it was not a good plan.

Mr. Smellzer: Do you practice early or late milling?

Mr. Winder: Of course that would depend on the condition of the curd. If the curd had been a little fast worked and cooked and perhaps too much acid before getting the whey off, I would mill it early, but in a normal working curd generally about midway from the time of removing the whey and when it is ready to salt, or about one and one half to two hours according to cnditions.

Mr. J. W. Moore: What effect has milling early on the curd that has too much acid in the whey? Will it cause that cheese not to get acid, while with a late milling it would get acid?

Mr. Winder: I believe in milling early you allow the excess moisture that is usually in a fast worked curd to escape much better tthan if it is milled later. If you allow it to mat down before it is milled you are apt to get a sour, acidy flavor.

Mr. J. W. Moore: You think there would be a smaller per cent of moisture carried over in the cheese?

Mr. Winder: I could not say about the percentage of moisture but I am satisfied the acid would develop slower after it is milled than before and it is very likely there would be less moisture in the cheese, although I cannot say from experience.

Mr. Moore: How about gassy curd?

Mr. Winder: As a rule I mill a gassy curd when it gets acid, usually about the same time. A gassy curd I like to get out of the whey with a little more acid than I do an ordinary curd. I like to have it well cooked.

Mr. Moore: You do not believe in matting your curd thin and matting all the gas out before milling?

Mr. Winder. No Sir, I do not. I very seldom pile more than two deep with any kind of curd.

The President: Mr. Noyes will now talk to us on the Paraffining and Storage of Cheese.

PARAFFINING AND STORAGE OF CHEESE.

H. L. Noyes, Muscoda, Wis.

Mr. Chairman, Gentlemen of the Convention:

The Subject assigned to me by Mr. Baer seems to have been pretty well threshed out yesterday both in the forenoon and in the afternoon, and I can say very little more than has been brought out by the argumnts of Mr. Moore and Mr. McCready. What little I have prepared I will read because I have prepared it but it seems useless to read what I have written after these discussions have come out.

Mr. President, Members of the Convention, Ladies and Gentlemen:

In the early nineties Boston and Philadelphia dealers began paraffining cheese with so much success that the method spread to such an extent that now nearly all the dealers demand that their cheese be paraffined.

I believe that Mr. Deland was the first to paraffine cheese in Wisconsin and was pronounced by him a success, and very soon after this all the dealers took it up.

All cheese should be cured a little before paraffining. As small cheese cure more quickly than large cheese they may be paraffined sooner after leaving the hoop, the larger cheese takes longer to dry out and cure so should be held longer on the shelves before paraffining.

If cheese are paraffined just as soon as they come from the hoop thy have no rind and the paraffine will not stick also the cheese are likely to rot on the surface, and the flavor will not be as good.

Some cheesemakers seem to think if the cheese are paraffined they can finish them any old way, but it takes a nicely finished cheese to look nice after it is paraffined, as every defect shows through the paraffine.

To have your cheese look nice after paraffining you should have a cheese that is square, bright and has a nice firm rind.

It is claimed by experts that paraffine should test 124 degrees, that is, paraffine that will melt at that temperature; although some dealers use paraffine of lower test which will do in the winter time but would not advise any other time of the year. The harder the wax the nicer finish your cheese will have.

The question often arises where should the work be done, I should say the best place to paraffine cheese is in the warehouse or cold storage where all of the cheese will be done alike, no chance for the cheese to be paraffined too green, some factories get the paraffine on very thick so that it scales off and some of the cheese in hauling and shipping are liable to get damaged, dirty and the paraffine scraped off.

Before paraffining all circles should be removed, also any dust or mold that may happen on the cheese. Many makers in our section do not use circles; they leave the press cloths on until they are ready to ship, then they strip them off and box them at once, they will not face check because they seem to have a heavier rind, which is very desirable for paraffining and cold storage use.

There are several kinds of tanks used, any of which are good if the paraffine is kept at the boiling point or smoking point.

At our warehouse we use the tank with steam connections, that is with steam pipes on the bottom and sides of the tank.

We have a frame made to fit the tank so it will work up and down easily in the tank, adjusting with weights, and cords to correspond with the weight of the cheese, so that with a light pressure of the hands it may be forced into the melted wax and brought back with the weights very quickly.

The cheese should be placed with the sides resting on sharp corners of angle iron while it is being dipped, and remain there after being brought out just long enough to cool the paraffine.

The cheese boxes for paraffined cheese should be big enough to keep the sides from scraping the paraffine off when you put on the boxes.

For curing cheese in cold storage the best temperature is from 34 to 36 degrees F.

The best storage cheese are the cheese that are well made, good rind and good flavor, also cheese that are made in a clean factory, I know of a maker that keeps his factory in a very dirty condition, you look at his cheese when they are from one to three weeks old and they show up very nice, you put them in cold storage and at the end of six months they will smell just the same as his factory and you will have to sell the cheese for fish bait, so beware of dirty factories.

Soft cheese are put in cold storage in the summer by dealers because they cannot put them out to the trade but they do not make a desirable article and are liable to go off flavor.

Cheese that have too much moisture in them will rot on the surface which rests on bottom of box or in case of two in a box the surfaces which come together also will be affected, the same with cheese that are sour and cheese that have no rind.

You take a cheese that has been closely made, clean flavored, good texture and a good rind are the cheese at the end of six months or a year that are bound to give satisfaction wherever you put them.

Cheese should be put in cold storage just as soon as they are paraffined and kept there until they are ready for consumption.

Cheese with a poor texture and flavor are a good deal helped by putting them in cold storage, and sometimes a poor flavor nearly leaves them after being in cold storage six months.

The President: Is Mr. Kalk in the room? We will now listen to a paper by Mr. Kalk.

PRESSING AND BANDAGING CHEESE.

H. A. KALK, Plymouth, Wis.

Through the courtesy of Mr. Baer, I was requested, as an American cheesemaker, to write a paper on Bandaging and Pressing Cheese for this convention: As I am no orator, I hated to do so, but thought to please Mr. Baer, I'd do the best I could, and hope the audience will excuse me for all the blunders I may make.

The first thing we have to do is putting the bandage straight on the ring of the hoop and wrinkle that end of the bandage that goes to the bottom of the hoop, so it laps over about one inch and then see that the seam of the bandage runs straight up and down in the hoop.

Now we fill our hoops, put a little curd in first, and straighten that with your hand so you do not move the bandage. And see that you fill them all alike, and get them nice and even, they will look nicer and you will have less trouble in boxing your cheese.

The best thing is to weigh them all so as to make sure they are all alike. But this takes too much of our time, when you have to fill from 75 to 150 Y. A. or Longhorns a day. Then the man that does that every day can tell pretty nearly how much curd to put in each hoop. Now we are ready to put the cheese in the press, we put on a cloth circle one half-inch smaller than the hoop, then a clean follower. We put on a light pressure at first; for about fifteen minutes, then we set the continued pressure on our cheese for one-half to one hour, till we dress them. I am using the Automatic Press or better known as the McKinnow Press. I am using hot water to wash off the loose grease so the cheese close up better, I turn every other hoop in the press bottom side up so they press nice and straight.

I leave the cheese in the press from 10 to 15 hours, and when I take the cheese out of the press and find one that is not pressed very good, take it out and wash it in hot water and press it over again.

Never take a cheese to the curing room before you have a good finish on the cheese.

A well shaped, properly bandaged with good edges, and well handled cheese will sell for more money and give better satisfaction to cheese dealers and to the trade, than an ill shaped, lop-sided, and carelessly handled cheese, no matter how good the texture and flavor is.

The looks of a cheese can be improved by using clean hoops, clean followers and press caps, and will use ready made or sewed bandags as those are the only kind that will fit telescope cheese hoops and keep the cheese in good shape.

DISCUSSION.

Mr. Stollenwerk: At what temperature do you put the curd in the hoops?

Mr. Kalk: It just depends on the season. For a small cheese I have the temperature higher than for a larger cheese. For a big cheese in the winter I want a temperature of between 70 and 80 and for a small cheese between 90 and 95.

The President: At this time we will take up the next paper by Mr. Dassow.

BOXING AND SHIPPING.

R. P. Dassow, Sheboygan Falls, Wis.

The subject assigned to me, "Boxing and shippings," would at first thought seem unnecessary to bring before this meeting, but that is not the case. Inquiring with the dealers I am told that only one lot out of ten are boxed right.

After the cheese has left the hoop, well bandaged, straight, all defects removed, and ready to be boxed, care should be taken not to use anything but good clean smooth boxes.

That is very important as dirty or rough boxes will spoil the looks of the whole lot of cheese. Next give good weight, three-eighths or one-half over to allow for shrinkage. When boxing your cheese in a box have them all the same height.

Do not mark the weight on the box with a lead pencil, sometimes on one side of the box and the next time on the other, but put it on with a rubber stamp, always next to the lap or seam. The figure should be about three-fourths of an inch in size, it is a very easy matter and the rubber stamps do not cost much.

Have a stamp for each figure you need, for instance if you want to box daisies you will need only two or three say 19, 20 and 21, lay them always in the same place and it is done just as quick as with a pencil and looks much better, and they are always alike.

On the other side of the seam or lap, mark the date the cheese was made also with a rubber stamp, but the figure should be smaller then the other, about one quarter of an inch in size, you need not put on the month just the date, and if you make in two vats mark that also with a stamp A. and B.

The object of doing this is that when the shipment reaches the dealer he will not have to plug every cheese and ruin the whole lot, but he can plug one cheese from each day or each vat.

And if you parrffine your cheese at the factory and box them before they are cured you can find any day of cheese you want.

Another plan is to mark them from one to seven or from one to fourteen if you make in two vats, that would be all right if you ship every week seven days' cheese, but would you paraffine your cheese at the factory and box them before they are cured this is not satisfactory.

Shipping. Always haul your cheese on a spring wagon, or sleigh, to the warehouse or freight depot and cover with a canvas to keep off the sun and dust, also the rain. Handle with care, do not roll on wagon but send on end. If rolled on the cheese will get three cornered in hot weather where you box four in a box.

Where you paraffine at the factory it is very important that the cheese are handled with care as it is the only objection to paraffining at the factory.

DISCUSSION.

Member: How do you trim your box down?

Mr. Dassow: I do not trim them down. Years ago we used to trim our boxes but of late years most of the dealers do not want us to trim the boxes and for the reason that every factory does not do it good enough.

Mr. Waterstreet: How long do you allow the cheese to remain in the paraffine, Mr. Noyes?

Mr. Noyes: Dealers want to paraffine as hot as we can get it, cheese dipped and out as quick as possible. We paraffine cheese with the bandage on, which you do not, which may make a difference. I know in your warehouse they hold the cheese in a tank fifteen or twenty seconds while we never keep a cheese in the paraffine more than a second, just as long as it takes us to manipulate it.

Mr. Waterstreet: Don't you think by holding it in the paraffine fifteen or twenty seconds it would soak into the rind better?

Mr. Noyes: We do not have any trouble with that but you must be sure to have the paraffine very hot. We have something like ten factories bringing in cheese each week. Those cheese are all paraffined and there are only two factories out of the entire number that do this paraffining right while I have seen some of those cheese in cold storage where the rind was rotten caused by paraffining while the cheese was so green they did not have any rind on them.

Member. Mr. Dassow is it not a good practice to put the dates on the cheese rather than on the box?

Mr. Dassow: No, because if on the box the dealer will not have to open the box to find the date. I might further state that this small date might be put right under the weight but I think it looks better on the other side of the seam or lap.

The President: The next on the program for this afternoon is the Influence of Dairy Farming on Morals by Mrs. E. D. Baker, of Edmund, Wis.

THE INFLUENCE OF DAIRY FARMING ON MORALS.

MRS. E. D. BAKER, Edmund, Wisconsin.

Delivered by Miss Lillie Baker.

When I received a letter from Mr. Baer, Secretary of the Cheese Makers' Association, asking me to write a paper on "The Influence of Dairy-farming on Morals," I felt almost as if I had been asked to wear my last season's bonnet, as I once read a paper before the Farmers' Institute on the "Influence of Farm Life on Morals." What was once said, if true, can be repeated and I beg your clemency if I repeat one or two paragraphs from that article.

What is true of dairy-farming is also true of all agricultural pursuits so far as family relations are concerned, and in speaking of the influence of dairy-farming on morals and on fitting the young for the great issues of life, I believe there is no place like the farm to inculcate those qualities of body and mind, those principles of honesty and virtue necessary to fulfill the requirements of a useful manhood and womanhood.

The prospective and the retrospective views of life are widely different. They are views from entirely different standpoints, and it is a great comfort in age to be able to look back on a well spent life. While no man can say he has made no mistakes, the head of a well regulated rural home where love is the key-note, and the Christian spirit rules, can as near come up to the standard of perfection as any living creature barring no exceptions.

The divine command to multiply and replenish the earth is just as incumbent upon the men and women of today as it was the day it was given utterance, and it is here we are privileged to live the life nearest the original plan. It is here we have all the elements required to develop and sustain the strongest characters; it is here we are brought into close relation with our children—where we can close the doors, so to speak, against the evils of outside influence.

Character forming is as peculiar unto itself as character judging. We never know when a person is going to form his estimate of our character, neither do we know what trifle is going to influence the character of our child for life, therefore it is very important to keep a constant watch over our child, to strengthen those traits of character we want strengthened and suppress the traits not to be desired. Cultivation has more to do with your child than with your land, and we are the people who have the best implements for child culture. I maintain that the foundation of a person's character is laid and the habits well formed during the first twenty years of life, and one rarely sees a well balanced youth of twenty lead a life far wrong. The precepts of youth are too strong to be now overcome by evil associations.

Obedience is the fundamental law of good citizenship, and it should be the first thing taught a child. This is not always easy, but it can be done, not by cruelty or austere command but by love and firmness. "As the twig is bent the tree is inclined," and this is as true of child life as in plant life. A man would never give his child a horse to drive that had never been controlled, yet I have seen parents sanction marriage relations in their families where the contracting parties have seldom or never been controlled save by their own desires. If a man used as much care and good judgment in selecting a companion for life, and mother for his children, as he does in selecting a cow for his dairy the results would be better than we now have. In our little farming community around Edmund we have some of the very finest specimens of young manhood, and womanhood, I have ever met, and they have been raised on our dairy farms.

Wisconsin farms have furnished the nation some of its most illustrious men, and our community has done its share. I could name many who are at the head in their lines of work. The noted Dr. Frank Billings, of Chicago, was born and raised not three miles distant.

The late financial crisis brings no discomfort to the dairy farmer. Our cows go right along giving good rich milk—the cities must have our butter—we get our money and our child knows no fluctuation in the times, while almost every other industry is suffering, from the panic. There is a vast difference now in selling your cow for a canner or selling your milk in the can.

Child life should be studied by every mother. We are a part of a divine plan each to help perfect or mar the original scheme of creation. What part each individual takes in this divine plan is to be determined by the individual himself, and the individual's life is largely determined by heredity and early environment, and it is on the farm we get the best results. It is here the son with his father, the daughter with her mother ,early learns the lessons of obedience, industry and self-reliance, the fundamental principles of good citizenship and usefulness.

I know a little of the feeling our city neighbors have for us and while our lives are not all joy we are the heathiest and happiest class of people I know. We are not isolated by any means. With advanced civilization we keep abreast with the times, and are surrounded by all the comforts and many of the luxuries of life. We miss the extremes of wealth and poverty both of which are injurious to the healthy, vigorous growth of body and mind. We miss the extremes of the tragedy and comedy of life, but we possess universal good fellowship with all mankind, a kindly interest in our neighbors and a degree of self satisfaction that amounts to great happiness.

Assuming that I am addressing dairy farmers and their wives let me say: Educate your children, give them the best in your heart and in your life. You cannot lay out a path for your child to take, you can only hope to guide him in the path he chooses.

The men of state, finance, commerce and the church are the sons whose early lives have been spent on the farm. The men and women who take up the burdens of the coming generation and carry on the immense scheme of creation are the issues we leave behind—the men and women raised on our dairy farms.

Mr. Baer: Something over two months ago, while making the preliminary preparations for this program, I wrote Mrs. E. D. Baker, of Edmund, Wis., for an address along this topic. At that time Mrs. Baker was very ill and she has been ill all of the time since. However, I am pleased to report to you that she is improving very much and she has sent her daughter, Miss Baker, to deliver this address rather than disappoint us, a courteous thing on the part of a perfect lady to do to an association of gentlemen; and I think it is a wise and a nice thing and a proper thing and a thing that we will be glad to do to thank Miss Baker and to send back to Mrs. Baker our best wishes for her speedy recovery to complete and perfect health, and I want to move, Mr. President, that we do this by means of a standing vote.

Motion seconded and unanimously carried by standing vote.

The President: We have with us the Honorable S. A. Cook, of Neenah, who was kind enough to give to the cheesemakers the three beautiful chairs you see on the platform, and we would be glad to have Mr. Cook say a few words to us.

ADDRESS.

Hon. S. A. Cook, Neenah, Wis.

Mr. Chairman, Ladies and Gentlemen:

I thank you for this kindly greeting and I wish I had words that I might do justice to the occasion. I may have some ideas in regard to the production of butter and cheese, that if put in practice would be of some use, but I did not come down here to inflict them on you; however, I hope if time will permit and business affairs will permit and God spares my life to work out some of these ideas myself on my own farm with my own herd, and when I do come with these ideas and experiments I will come as a competitor, for I am a firm believer, my cheese maker friends and my butter maker friends, if there are any here, that quality has much to do with the demand and the demand has largely to do with the price on legitimate business. These are cold plain facts that you cannot get away from if you would.

I have been perhaps longer interested in this matter than some of you may think. I have been for the past year or two trying to get just the right kind of farm on which to demonstrate some of the things and I expect too that it is just possible that I am getting my experience cheaper than anything I would get if I had the stock. I am getting some experience as I go along. I have been through the country quite a good deal, learning what I could of the best method and if the milking machine had been a success I would have been in it to a considerable extent before this.

In passing through I have tried to take down a few notes. I am not a public speaker. My life is a hard kind of life and for the last few months I had to give up farming to try to get funds enough out of something else to pay our labor, but in a few months we will be able to do more business, buy your products and pay a better price for them. I have a few ideas here which I would like to read to you. They are my ideas of what we must come to and if they do not fit any of you they will not cost you anything. If you will keep that in mind you will treat my remarks as gently as you can. It is a great pleasure to be here facing an assemblage of men and women who are interested in the higher development of one of the world's greatest branches of commerce—the profitable manufacture of pure, healthful, nutritious cheese.

It is a greater pleasure to know that the intelligent discussion of scientific theory, and the application of brawn and brains in practice by the members of this association, have resulted in giving Wisconsin a big area on the world's dairy map, and advancing her to the front column in competition for the finest quality of cheese sold in the great markets today.

There is not now a dairy region in the world that does not know Wisconsin is openly in competition with it, through her courageous, industrious, intelligent and persistent stock raisers, dairymen and cheese makers for the blue ribbon seat on the chariot of dairy progress.

Through your efforts, and the efforts of kindred associations, the cow with the crumpled horn, an udder like a fifty-year-old doodle-sack, a back filled with grubs and carrying a wagon load of fertilizer on her haunches at milking time has been pushed off the earth. Stables that had neither comfort nor proper sanitation have been removed from the farm. The crude and wasteful methods of feeding and caring for stock, and handling the produce of the dairy have followed the suggestion of the last wink of the tallow dip, and faded away.

All over the state of Wisconsin the pastures in season are beautiful with stock herds that challenge the admiration of the world. Stables ventilated and furnished with care equal to that we bestow on our houses shelter such herds in the winter. Every ounce of nutriment in the foods supplied is saved and the kind of food best adapted for producing bone, muscle, milk and cheese is known on nearly every farm and fed there.

Out of one of the herds owned in Fond du Lac county, a cow has been bred, as you all know, that surpassed in 1907 the world's previous record in produce of butter fat, having produced in one year 1,200 pounds of butter. That represents a value of at least $300. The parents of that cow ought to be proud of her. But she never could have made this wonderful record if the disciplined brains of the dairy farmers and stock breeders had not been lent to her in care and food and encouragement. And the same reasoning can be applied to the record breaking cow of 1906 from Marathon county.

I congratulate the people of Wisconsin that they have an organization of cheese makers—an organization of men and women who are representatives from the largest number of citizens engaged in a single occupation in the nation. The people engaged in agricultural pursuit in the United States now number approximately 32 million.

I am proud to say you have done a great work and are destined to do a greater for in the great dairy state the industry is almost in its infancy when opportunity is considered.

You are educating each other to understand that it is not alone the large number of acres, or the large herd of cattle, horses, sheep or hogs that makes farming successful—that makes it possible for farmers to educate their children, furnish their homes with some of the modern conveniences of life and lift some of the burdens from the faithful wives and daughters, but more what can be realized in value in a given time from each acre, each cow, horse, sheep, hog and hen by careful selection and proper development. You are making farm life more respectable—if that were possible—by educating the farmer to respect himself. You are helping each other to see and understand that the farm presents greater opportunity for right development of the brain for service of humanity than any other occupation known. The man who can successfully manage a dairy and stock farm must embody peculiar ability. He must be capable of working hard and keeping a watchful eye over details. He must be an organizer who knows how to direct and treat his workmen. He must be a good trader, knowing when and how to buy to the best advantage, knowing when and where to sell at the largest profit. He must understand finance and know how to keep accounts. He must know the course of public matters so he can direct the balance of power he holds in his ballot to compel legislation that will be fair to his interests and at the same time just to his fellow man.

The farmers who are all this are multiplying every year, and the country is richer in consequence. They are the men who are found to be capable of managing anything that emergency of neighborhood or nation imposes on them.

Farmers and dairymen who have their land and stock paid for, and are putting their brains into their success, should be the happiest men in the republic.

Business gets dull, and the merchant wears a bald spot on his block and patches on the elbows of his pants trying to figure a way out of his worries; banks may make unfortunate investment; receivers may take charge of great railroad and industrial enterprises and strive to figure a way out for the distressed stockholders.

But the successful farmer need not worry about such matters. He has a foundation that can not be disturbed. The bosom of his broad acres swells with abundance of produce, and the consuming millions buy the yield of his land and flocks and herds. He is a veritable monarch within his boundaries. His sons are developing splendid manhood under the finer suggestions that accompany a life lived near to nature, and his daughters are examples of virtue and womanly grace. His children are contributing to the country its best manhood and womanhood.

The farmer, the stock breeder and dairyman, who knows his business and owns his property can snap his fingers in the face the world's adversity. If he is not happy, if he does not eat the fat of the land in contentment because he is so great a benefactor of his fellow men, he is not living up to the full measure of his opportunities.

Wisconsin cheesemakers, my earnest wish for you is that you may continue in your great work of helping feed the 85 millions of the people of this blessed nation, each year with added intelligence and greater prosperity, and that I may keep fellowship continually with you as a member of the Wisconsin Cheese Makers' Association.

The President: Gentlemen, the last speaker is the man that donated the chairs as premiums, as I announced before. I will further state that for many years he has been a member of this association and has shown that he has the welfare of the cheesemakers at heart by sending in a check for $25 every year and also $1.00 for membership. I think it would be no more than proper to give Mr. Cook a rising vote of thanks.

Mr. Cook: May I just have one word? While I thank you for these kindly words, yet I want to say to you in all candor that I was not giving those chairs for any particular benefit. The man that won those chairs could only get them by the merit of his work, and I contend that any man that wins one of those chairs is helping his neighbor, helping every man in the butter and cheese industry, helping the country, helping the state and the country and the cheese markets of the world. I am only doing my duty as a citizen of Wisconsin and receive my benefit by seeing our industry improved. (Continued Applause.

The President: The next topic on our program for this afternoon is a Simple Test to Determine the Casein in Milk, which will be demonstrated by Dr. E. B. Hart, Professor of Chemistry, Agricultural College, Madison Wisconsin.

A SIMPLE TEST FOR CASEIN IN MILK AND ITS RELATION TO THE DAIRY INDUSTRY.

DR. E. B. HART, Madison Wis.

Prof. of Agricultural Chemistry.

I presume that some of you present, especially the busy cheese makers, who have looked over this program and noticed its fullness with new tests and apparatus, have thrown up your hands in horror only to exclaim, when are we to have time to make cheese? But the business of milk production and the business of cheese manufacture will sooner or later demand more complete means than are at present available for arriving at the composition of its raw materials.

A great forward step in the dairy industry was made when the Babcock test was evolved. This simple method succeeded in doing for the butter industry what the more technical chemical methods do for other industries—that is to control the amount of any single constituent of commercial importance in the raw material. Today no industry managed on a sound business policy would think for a moment of buying its raw materials without first knowledge of the amounts of the desired constituents in such material. The payment for milk for butter production by the fat test has become practicable and is widely used.

Another thing the fat test is accomplishing of equal if not greater importance, is to raise the fat producing capacity of our dairy cows and to eliminate unproductive animals from our herds. By processes of selecting and weeding out, the average fat content of milk, we are told, has been raised at last a half of a per cent since the introduction of the Babcock test. It it also preventing the skimming and watering of milk by maliciously-intended persons. These are great accomplishments.

THE IMPORTANCE OF A SIMPLE CASEIN TEST.

Parallel with the introduction of the fat test, has come the attempt to grade all milks by the amount of fat they contain. It is highly proper that the valuation of any milk for butter manufacture or cream production should be made on the amount of fat it contains; because fat is the most important and principal constituent of these products. But the proposition that the percentage of fat is also a measure of the value of nearly all milks for cheese production, has not been generally accepted.

ARE FAT AND CASEIN IN DEFINITE RELATIONS IN MIXED MILKS?

Cheese is made up almost wholly of fat, casein, and water. The first two constituents of milk control the yield of cheese under uniform conditions of manufacture. If the process of manufacure is varied, then of course the yield would vary, but the fluctuations in weight of the product produced will depend upon its water content, granted we are working with the same milk.

Experiments by several investigators have shown that at the same season of the year rich milks do not yield as much cheese in proportion to the fat they contain as do poor milks, but that a rich milk toward the end of the season may do as well as a much poorer milk earlier in the season. Dean of Guelph, Canada, and Dr. Babcock have concluded that uniformly a rich milk yields less cheese in proportion to the fat contained in it, than does a poor milk. (Show Chart.)

But why is this? The reason for these conclusions is to be found in the variable relation of the amount of casein to fat. Two lots of mixed milks may contain exactly the same percentage of fat, and yet the amount of casein will be quite unlike. (Average composite of milk, patron's chart.) As an illustration, one of the patrons at our University creamery delivered milk containing four per cent of fat, and 2.4 per cent of casein, while another delivered milk containing four per cent of fat and 2.9 per cent of casein. If we accept the simple rule for the calculation of the cheese yield for one hundred pounds of milk when the fat and casein are known—multiply the per cent of casein by 2.5 and to the result add the per cent of fat multiplied by 1.1—then the first milk would yield 10.40 pounds of green cheese, while the second yields 11.65 pounds. This clearly shows that for cheese production the amounts of casein and fat should be known to both producer—the man who owns the cows—and the man who buys the milk. The recognition of the fact that even mixed milks do vary in the relative percentages of casein and fat, is not new. The practical man, as well as the investigator, has recognized this in his observed yields, but he has only had recourse to a single test, the fat test, to control his raw material, and of necessity was compelled to rely upon it alone. This suggests the supplementary use of a casein tesa.

However it is pretty well established, that herd milks rich in fat, are also richer in casein, and further believed by many that cheese made from the richer milk results in a product of finer quality, and should bring a better price so that in the absence of a simple casein test, there is consequently no question but that the most equitable basis for the valuation of milk for cheese production has been on its fat content. Pooling of milk at any time is to be discouraged. It is unfair to the producer and does not encourage the improvement in the qualiy of the dairy herd, and may work serious injustice to the buyer by encouraging skimming and watering.

DOES THE RELATION OF CASEIN TO FAT VARY IN INDIVIDUAL COWS?

In the milk of individual cows, there is certainly no definite and constant relation between the amounts of fat and casein. One animal may yield a milk containing 2.7 per cent of casein and 6 per cent of fat, while another produces a milk of 2.7 per cent casein and 4 per cent of fat, and still another a milk carrying 3.5 per cent of casein and 6 per cent of fat. These figures are actual analyses of milks of individual cows in the University herd. Expressed in another way, we have milks where for every hundred pounds of fat, there may be anywhere from forty-six to seventy-three pounds of casein. Surely it is clear that for cheese production a milk carrying for every hundred pounds of fat seventy-three pounds of casein, would yield more cheese than one containing but forty-six pounds of casein. This is not fiction. (Discuss Chart.) Shuttleworth of Canada and Hill of Vermont emphasized the variety some years ago.

But why emphasize this fact of the variation of the casein and fat content of milk? Simply this, that in the minds of not a few dairymen, cow's milk contains these constituents in a definite and fixed relation. That when the fat increases, the casein rises in a fixed and definitely related proportion. This may or may not be the case. It may be true if we average a great number of milks, but here lies our most important point, and that is, that it is not the average that is to guide us in our methods of improvement, but rather the exception and the deviation from the average. The producer and the cheese maker who pin their faith to such a belief are in the path for progress. Normal milks vary greatly in their composition and are greatly affected by a variety of conditions, such as individuality, breed, advance of lactation, etc. The estimation of any single constituent, as fat, only allows us to guess how much of any other of the milk constituents is present. The breeder, through the Babcock test, has made a butter cow, one where the fat is unusually high, and he has done this by selection. It does not seem at all impossible that with a simple casein test, the cheese cow can be developed, one where the relation of casien to fat is especially high. Where for instance, instead of a milk with 73 pounds of casein per hundred pounds of fat, we can produce a milk containing nearer one hundred pounds of casein for one hundred pounds of fat. It is probably extremely rare that the milk from a herd of cows contains casein and fat in the relation of 70 or 80 to 100, but it certainly is not uncommon in certain strains of certain breeds and among individuals in any breed, to find as high or a still higher relation. And here lies at least another important field for a simple casein test.

Another matter of considerable importance in the discussion of the relative amounts of casein and fat in cow's milk presents itself, and that is the relative commercial values of these two bodies. Both casein and fat are important foods, casein belonging to that generally more expensive class of nutrients—the proteids—and popularly called the flesh builders. Yet at prevailing prices at our creamery a pound of fat is worth 25 cents, while a pound of casein as allowed for skimmed milk at 30 cents a hundred is worth about 12 cents. If we allowed the same value for fat in cheese as it commands in butter, then the casein per pound in *whole* cheese is worth about 18 cents. On the theory that the feeding or nutritive value of these two constituents depends on the amount of heat they can produce, the fat could have about double the value of casein, but nutritive value and heat producing capacity are not with certainty to be so closely correlated.

On the basis of cost of production it is a fair assumption that it has cost the feeder as much to produce a pound of casein as a pound of fat. The proteins to which casein belongs, are nitrogen containing bodies and are the farmers' most expensive nutrients. When the farmer sells casein he is selling nitrogen, but when he sells fat he sells his cheapest source of nutrients—the air and water. It appears that there is something irrational and unbalanced in the relative commercial values of these two products. From the farm point of view the sale of casein is a greater agricultural drain than when the fat is sold, and from this view point alone it would appear that these two milk constituents should at least have a closer commercial value.

I am well aware of the fact that there are many factors entering into the valuation of commercial products,—a pound of protein from a lobster is worth commercially 8 times a pound of stew beef protein,—but it hardly seems rational that the milk constituents, when made into butter, whole cheese, or fed as skimmed milk should have values so widely divergent.

THE TEST.

PRINCIPLES INVOLVED IN THE METHOD.

1. Construction of tube and scale whereby percentages of casein in the milk are read directly.
2. Establishment of a proper volume of milk to be used that will conform to the tube and scale adopted allowing percentage of casein to be read directly.

In summarizing what I have said to you today, I beg to make clear; *First,* that milks vary in their composition, both as to the amount of casein and fat, *Second,* that casein and fat are not in a fixed and definite relation in milk, that we may have an increase of fat without a proportional increase of casein and that the actual composition of such milks can only be known by distinct and separate determinations of each of these constituents. *Third,* that there is a commercial difference between milks and this commercial difference is of such importance to the buyer of the raw material that he should not fail, if he is to father a keen business policy, to take cognizance of this fact. *Fourth* I think, that, admitting the variable composition of milks, we cannot deny that the fat test, as a basis for payment for milk for cheese production, has its limitations; but should we discard it or refuse to accept it? Most certainly not. We should all adopt it. It is far and above the best guide we have today for this valuation. It not only, from actual data already shown, establishes the fact that milks rich in fat, increase the cheese yield, though perhaps not always proportionally, but it stands as an implement for moral regulation, a guard against fraudulent practice, against skimming and watering, which is a protection to the cheese maker, as well as a bonus for the cow owner and producer of richer milk.

As a Canadian authority in dairying has well said,—"should the hungry man refuse the half, because he cannot have the whole loaf and thereby starve?" Again I must say, most certainly not. *Fifth,* the ideal is the fat test, supplemented by a casein test, and this ideal we hope may soon be realized. Should the casein test that I am about to show you, fail because of impracticability, or unreliability, I still believe that the cheese makers of this state and the dairy interests in this state will profit most by the adoption and use of the fat test.

Still further, until the casein test has had the stamp of approval placed upon it by other experimenters than ourselves, although I believe, when properly conducted it is a reliable test, I do not advocate its hurried adoption at the present time. There are no patents or royalties pending, and none to be taken out. No manufacturer monopolizes any part of the apparatus. But I desire to be conservative in this matter; I am going to show it to you today as what I believe to be an accurate test and the solution of a very vexed problem and possibly an instrument for higher production of casein and should any of you desire to put it into practice, you are most certainly free to do so. It is simple and operative by the unskilled, but it requires care and is not absolutely fool proof. It will not stand abuses, but I do not know of any test that will, and give results at all accurate. The test itself is founded on a few simple principles. The principles involved are the use first of a simple glass tube of that construction (illustrates) in which, in the bottom bulb of barrel shape, is a scale that is measured off reading from one to ten, and carries the percentage marks of casein in the milk directly on this scale. The principles involved are these, that milk when mixed with any acid curdles and if, after curdling, a proper contrifigual force is applied to that the casein drops into this little graduated tube in a pellet from which can be accurately read the exact amount of casein in the milk. The chloroform that we first add is added for the purpose of relieving the fat that is present. You understand that when you precipitate milk with an acid or as when you make cheese by adding rennet you coagulate the casein and incorporate the fat mechanically in the cheese. If the fat is incorporated in the fat mass, as it would be here, without any solvent, then there would be an increased reading due to the fat itself. That is avoided by the use of a solvent for fat. You know if you have a grease spot on your clothes and put chloroform or benzine on it it dissolves it, and so chloroform is used in this test. We accurately add 2 cc. of chloroform in the tube and then place on top of that solution a solution of very dilute acetic acid. Acetic acid is purified vinegar. However, we do not use vinegar but use acetic acid itself, which can be purchased as glacial acetic acid at 45 cents a pound. A pound of acetic acid will make some nine thousand determinations, so the expense of the acetic acid is absolutely nothing practically. That solution is made very dilute. If you take 10 cc. of glacial acetic acid and dilute it to 100, and then 25cc of that solution and dilute it to ten times 100 you will have the proper proportion. We add 20cc. of that solution on top of the chloroform.

Since the machine is a centrifigual one it is necessary to balance and it is necessary to run two in order to have the machine in perfect balance, so we have to prepare two tubes. Here we have the two sets of chloroform and dilute acetic acid. Here is a sample of milk that we got here in town, and we add accurately to that solution 5 cc. of milk. This of course must be accurately measured. Now we have the milk in the dilute acetic acid solution. It has become curdled. The chloroform, however, rests on the bottom, not mixing at all with the other constituents of the solution. In order to bring the chloroform in contact with the curdled mass and dissolve them, it is necessary to shake them. To do that, just place the thumbs over the barrel of the tubes and shake vigorously for fifteen seconds, no longer. Better look at the watch to have the proper time because if you shake longer you have an emulsion which is a little difficult to break up and is liable to give you an indistinct reading on the bottom of the tube. This is one of the essential factors in making the test, that the shaking must not be longer than for fifteen minutes. The chloroform has disappeared, it has broken up in the form of emulsion through the mass, but it has dissolved the little fat globules.

An important factor in the test, besides the shaking, is the proper temperature. This test is regulated for 70 degrees. That is the temperature of the acetic acid and the milk should be 70 degrees F. That is the temperature that should be regulated by the thermometer. If you have properly regulated the temperature and precipitated the casein, which should not have taken you any more time than preparing a Babcock test, and you have prepared the tubes in that way they are ready to go in the test. This tester is one that we had built ourselves. The first one was made by the Creamery Package Co. and I notice they have another one here today. This one is made to go directly into the ordinary Babcock tester. They are made stronger than the Babcock tester because of the high speed at which the machine must run.

An essential factor in the determination is that the diameter of the wheel here must be a definite diameter. The test is so regulated that the diameter of this circulating wheel inside must be fifteen inches. That is a standard diameter, fifteen inches, if we are to turn the machine two thousand revolutions per minute, and the test is set for exactly that condition. A fifteen inch machine turning two thousand times per minute. The tubes now have commenced to settle, the casein has commenced to precipitate but we do not see any chloroform. We put the tubes in the casein tester; be sure ot give them a turn and get them down onto the bottom. I told you that the principle on which it is made is that you apply definite force within a definite time. The force that is applied is a revolution of two thousand times per minute for seven minutes. In order to regulate the speed of the machine it is necessary to have some point, and this is in the shape of what is called a metronone, which is used by music teachers for regulating the speed to make it easy for the child to follow in getting his music lesson. This metronone beats at a certain speed, fifty-five or fifty-six times a minute is the correct number for the number of revolutions required. The test can then be begun. Start the machine at rather a low speed in order to see that everything is adjusted properly. I told you it was necessary to turn seven minutes after you got the proper speed. After you are in harmony with the machine it is necessary to turn for seven and a half or eight minutes, and after you have turned for that length of time, stop the tester, take out the tubes and let them stand for about ten minutes, and then read. You read, just as you would with the Babcock test, the percentage of casein directly in the milk.

DISCUSSION.

Mr. Marty: I would like to ask whether the temperature of the milk used for testing for the casein has any influence on the per cent of casein found in the milk?

Dr. Hart: The temperature is a very decided factor in influencing the accuracy of the test. The temperature that was chosen as the one most suitable is 70 degrees F., which is usually the normal temperature of the room. A few degrees above that or below may be allowed for an accurate test. Of course it is necessary that the milk be approximately the same temperature as the acetic acid solution.

Mr. Aderhold: Is it necessary to make a test frequently? Is there much variation?

Dr. Hart: I do not think the casein fluctuates from day to day in the milk of an individual cow. If your herd represents a select herd that is not being filled up by other cows, constantly changing your cows, the test does not vary very often, I think there is surely not a daily fluctuation. On the individual cow the casein test seems to be rather constant; it rises with the period of lactation but I think an accurate estimate of the casein produced by any cow can be made by testing at least once a week or once every two weeks. I do not consider it necessary to make a test oftener than that.

Mr. Aderhold: It would not be necessary to save a composite sample?

Dr. Hart: I do not think it would.

Mr. Haven: Then in a factory buying milk by the test, do you think a casein test once in two weeks would work satisfactorily in connection with the Babcock test?

Dr. Hart: The casein does not fluctuate the same as the fat but where a patron was bringing in new cows to his herd it would be necessary to make the test more often.

Member: Can we use a composite test?

Dr. Hart: A composite test can be used if you use the proper tablets, but if you use mercury, chloride tablets or sublimate tablets it cannot be done as it is better to make the test on fresh milk or milk only preserved a few days.

Mr. Dassow: According to that, we could probably pay our patrons on both these tests. Would that be an equitable basis for the payment of milk in cheese factories?

Dr. Hart: I am not going to discuss that. Dr. Benkendorf has a paper that will deal with that question.

Mr. Wallace: Are there more than six bottle machines made?

Dr. Hart: This is the first machine ever made by the Creamery Package Co. with six bottles. If they make them for more bottles they will, of necessity, have to change the diameter of the whirling disc, then the speed will have to be multiplied.

Mr. Aderhold: At the time of the invention of the Babcock test, nobody realized its value. This is a new invention and we do not know today what it is worth, but I have a resolution that I would like to offer, Mr. President.

Whereas, Professor Hart, of our State Experiment Station has invented a simple and inexpensive method of testing milk for its casein contents, and

Whereas, said invention promises to be a very valuable factor in the promotion of the dairy business in general, and

Whereas, In this invention the State of Wisconsin has through its Experiment Station been again brought prominently before the world as a leader in dairy thought.

Therefore, be it resolved, That our thanks are due and hereby tendered to Prof. Hart for his Casein test.

On motion, duly seconded, the resolution was adopted as read.

Dr. Hart: May I say one word, please? I want you to be conservative about this. At our station we are the only ones that have adopted this or worked it out, it has not been tried anywhere else in the country and I want you to wait until the approval and stamp of accuracy has been placed upon it by other stations. Do not be in a hurry. You have done a long time without it, now wait a year or so more.

Mr. Chas. Becker then introduced a German dialect monologist who entertained the audience for several moments and received a great deal of applause.

The Chairman: The next on the program for this afternoon is an address by Prof. G. H. Benkendorf.

AN EQUITABLE METHOD FOR THE PAYMENT OF MILK DELIVERED AT THE CHEESE FACTORY.

PROF. G. H. BENKENDORF, Madison, Wis.

In Charge Wisconsin Dairy School.

If we look over the programs of the Cheese Makers' conventions which have been held in this city for the past few years, and also the programs of the Butter Makers' conventions, held at various places over the state, we will note that both harp on the production of pure milk, the proper care of the same, the sale of its products, and kindred subjects.

There is, however, a topic discussed almost exclusively at cheese makers' conventions, which is not frequently discussed by the butter makers, and that is the proper method for the payment of milk delivered. I have looked over the cheese makers' programs for several years and notice that last year Professor Farrington was on for the topic entitled "Calculating Cheese Factory Dividends," and in the course of his paper he brought out what he deemed to be an equitable method for the payment of milk. Two or three years previous there was another paper entitled "Cheese Factory Accounting," which practically amounted to a discussion along the same line.

It is usually a difficult task for the man who gets up the programs to introduce new features so they will not become monotonous. Our Secretary, however, deemed, inasmuch as the casein test was perfected by Professor Hart during the past year, that it would be entirely proper to introduce the subject of the payment of milk again this year. There is no question but what this will be threshed over and over again for years to come because, after all, I believe it is almost impossible to devise a method for the payment of milk that will be absolutely equitable and at the same time practical.

The payment for milk is such a complex problem that when looked at from one side it has a different aspect than when viewed from another, and it all depends on the points of view taken by the patron and the owner whether or not they will be satisfied as to the method adopted for the payment of the milk at the factory. There is no question, therefore, but that some of you may disagree with some of the statements in this paper. I, therefore, hope that when the question is open for discussion you will all feel free to express your opinions.

There are several methods for the payment of milk in use at the present time, which may be briefly mentioned. They are,

First, The pooling system, or buying milk at a flat rate of so much per hundred regardless of the quality of the milk.

Second, The payment for milk according to its fat content as determined by the Babcock test.

Third, The addition of 2 to the fat content, as proposed by Professor Dean of Canada.

Relative to the first method—that of paying for milk at a flat rate of so much per hundred—it is hardly necessary to say that this is not an equitable way for the payment of milk. The solids in milk which determine the yield of cheese vary so much that it is impossible to establish a flat rate that is in any way fair to all concerned. Yet in this state, the home of the Babcock test, there are stlll many cheese factories that pay for their milk at a flat rate.

The second, or the one whereby we pay for the milk according to its fat content, as determined by the Babcock test, is undoubtedly not only the most equitable but also the most satisfactory in use at the present time. This method for the payment of milk is so well known that an explanation is not necessary. Yet there are certain phases that we may discuss with profit.

To justify this method we frequently see the following table showing the yield of cheese from milk varying in richness. These cheese were made at the Dairy School, first, by the late Professor Decker; another set was made later by Mr. Baer; then by Mr. Noyes, Mr. Moore and others, and approximately the same results were obtained each time. It is as follows:

TABLE A.

Yield of cheese from milk varying in richness.

100 lbs. of milk, testing 0.1 per cent fat	5.5 lbs. cheese.
100 lbs. of milk, testing 1.0 per cent fat	6.7 lbs. cheese.
100 lbs. of milk, testing 2.0 per cent fat	8.0 lbs. cheese.
100 lbs. of milk, testing 3.0 per cent fat	9.2 lbs. cheese.
100 lbs. of milk, testing 4.0 per cent fat	10.9 lbs. cheese.
100 lbs. of milk, testing 5.0 per cent fat	12.4 lbs. cheese.

While this table does in a way show that the yield of cheese increases according to the fat content of the milk, we believe that it is not altogether a fair comparison because most of the cheese were made from abnormal milk and therefore the results ought not to be taken too seriously.

It is a favorite theory of the Holstein and Ayrshire breeders that milk from their herds is better for cheese than milk from the Jersey or Guernsey breeds. The 13th annual report of the New York Station gives the following figures, which may prove interesting:

TABLE B.

Yield of cheese per lb. of fat from milk produced by cows of different breeds.

Breed.	Per cent fat.	Lbs cheese per 100 lbs. milk.	Lbs. cheese per 1 lb fat.
Holstein	3.36	9.54	2.84
Ayreshire	3.60	9.96	2.77
Shorthorn	4.44	12.03	2.71
Guernsey	5.30	13.05	2.46
Jersey	5.60	13.62	2.43

From this table you will observe the gradual increase in the amount of fat per hundred pounds from 3.36 to 5.60, or a difference of 2.24 per cent between the Holsetin and the Jersey. You will also notice the increase in the yield of cheese, showing that 100 pounds of Jersey milk, testing 5.6, made 13.62 pounds of cheese while the 100 pounds of Holstein milk, testing 3.36, gave a yield of only 9.54 pounds; or, in other words, the Jersey milk produced 4.08 pounds of cheese more than the Holstein milk. Therefore there is no fair minded man who can in any way claim that the man that delivered the Jersey milk ought not to be paid more for his milk than the man who delivered the Holstein milk. However, if we notice the pounds of cheese made per pound of fat we observe that there is a gradual decrease in the amount of cheese made per pound of fat as the milk gets richer. In other words, the Holstein milk gave a yield of 2.84 pounds of cheese per one pound of fat and so on down the line until we come to the Jersey milk which produced only 2.43 pounds of cheese per pound of fat. This is, so far as I know, very reliable data.

Dr. Babcock, of our own station, published in the 11th Annual Report of the Wisconsin Experiment Station the following table:

Table C.

Yield of cheese from milk testing different per cents fat as found from 347 factory reports.

No. of Reports.	Test of milk.		Cheese lbs,.	
	Extreme.	Average.	Per 100 lbs of milk.	Per 1 lb. fat in milk.
24	Under 3.25	3.1	9.19	2.9
90	3.25–3.50	3.4	9 23	2.7
124	3.50—3.75	3.6	9.41	2.6
43	3.75—4.00	3.8	9.81	2.56
46	4.00—4 25	4.1	10.30	2.51
20	Over 4.25	4.4	10.71	2.41
		3.64	9.56	2.6

Now, gentlemen, please bear this in mind that all these cheese were made from normal milk and not from abnormal milk. There is no question however, but that under ordinary conditions a more palatable cheese can be made from milk that is rich in fat content than from poor milk, and therefore it should receive a better price.

We must also bear this in mind that although this may be a fact we find that actually a buyer when he goes to a factory in Sheboygan or Kewaunee county makes little distinctio as to whether or not the cheese was made from 3.5 per cent milk or 4 per cent milk, so long as the flavor is good and the cheese up to his standard.

These tables, showing that the yield of cheese decreases as the richness of the milk increases, are the strongest arguments against payment for milk according to the fat content.

If these tables showed the same yield per pound fat whether the milk was rich or poor in fat, then no objection could be raised to the payment of milk according to this method.

Professor Dean of Canada sought to overcome this objection by adding 2 to the fat content and using the sum as a factor in making the computations. To illustrate, if a man's milk tested 3.5, he would add 2 making it 5.5 and use this number, 5.5, in the same way that we would use the test 3.5, when paying to the fat content.

This method would be quite satisfactory if the casein content of the milk was only about 2 per cent and if it did not vary in different milks. This, however, is not a fact because, as Professor Hart stated in his paper, it varies a great deal with the milks of different cows. Therefore the method is nothing more or less than paying for milk by the Babcock test and pooling the casein.

There is no question but what this method puts a premium on the adulteration of milk by the addition of water. It is very evident that a party having 4 per cent milk may add sufficient water to reduce the fat content to 3 per cent and in that way receive more for his milk than he otherwise would. This is possible because the factor 2 is always constant no matter whether the milk has been adulterated or not.

Inasmuch as Professor Hart has a method for the determination of casein in milk, which may prove to be practical and satisfactory in the hands of a man of ordinary intelligence, it may be well to look forward to the payment of milk according to both its fat and casein content. It is not the intention at this time to urge the adoption of this method, for we believe the invention should be given a thorough trial both in a practical cheese factory and at other experiment stations than our own. Therefore we think that it is well for the cheese makers to look into this matter and watch this test closely so that they will be in a position to judge intelligently whether or not such a method is an improvement over those already mentioned.

This method for the payment of milk is very simple and consists in testing the milk for fat and also ascertaining its casein content. The two are then added together and the sum used as a factor. For instance, if the casein content was 2.5 per cent and the fat test 4.5 per cent, we would add the two together and get 7.00, which factor we would use in the computations. It is very evident, therefore, that by this method the patron is paid according to the pounds of casein and fat which he delivers. In no way can he adulterate his milk and be benefited, for should he add water, he would simply reduce both the fat test and the casein test.

In order to bring this matter before you in a more definite way I have prepared a table, showing the various amounts that patrons would receive according to the four methods mentioned.

Table D.

A comparison of the different methods for payment of milk delivered at cheese factories.

	White.	Black.	Brown.	Green.	Total.
Fat tests	3.00	3.00	4.50	4.50	15.00
Casein tests	2.00	2.50	2.50	3.40	10.40
Cheese yield	8.30	9.55	11.20	13.45	42.50
Value of cheese at 12 cents per lb	.996	1.146	1.344	1.614	5.100
Pooling method	1.275	1.275	1.275	1.275	5.100
Fat (only)	1.020	1.020	1.530	1.530	5.100
Fat + 2	1.108	1.108	1.441	1.441	5.098
Fat + casein	1.001	1.104	1.405	1.586	5.099

It is assumed that each patron delivered 100 pounds of milk varying in casein and fat content.

The cheese yield was found by multiplying the casein content by 2.5, to which was added the product obtained by multiplying the fat by 1.1. This method of determining the cheese yield has been found in practice to be approximately correct. The value of the cheese was obtained by multiplying the cheese yield by 12, assuming that each pound of cheese was worth 12 cents. The sum ot the four values is $5.10. This amount is then divided according to the different methods. We notice that in the pooling method, inasmuch as 400 pounds of milk were delivered, we divide the $5.10 by 4 and get a value of $1.27½ for each hundred pounds of milk regardless of its richness or the casein content. You can easily see, therefore, that Mr. Green delivering the rich milk should have received $1.61 when in reality he received only $1.27½.

According to the fat method for paying for the milk we find that White and Black both received $1.02 and Brown and Green $1.53, although the milk that Green delivered made 2.25 pounds of cheese more than the milk that Brown delivered and he should have been paid accordingly.

By the fat plus 2 method we would pay Mr. White $1.11 and Mr. Black the same, although as can be seen one delivered milk having a casein content of 2.00 per cent and the other 2.50 per cent. Similarly Brown and Green each received $1.44. In both cases it is plain that the man delivering the milk with the richer casein content does not receive his proportionate share.

In the fat plus casein method we notice that each one is paid a different price and the man delivering milk with a low fat and a low casein content does not receive as much as the man that has a higher casein content although he may have the same amount of fat.

In comparing the varying amounts paid these farmers, according to the different methods, with the actual value we note that the greatest variations from the actual value occur in the pooling system, which proves that under this system the greatest injustice is done. We note also that decidedly more variations occur in the fat plus 2 method and the straight fat method than in the fat and casein method. It is therefore very evident that this fat plus casein method, if it can be made practical, is the most equitable way of paying for milk at a cheese factory yet proposed.

In order to show the difference between the amounts received by the patrons and what they actually should have received, the following table has been prepared.

TABLE E.

Table showing differences between amounts received by patrons and what they actually should have received.

	White.	Black.	Brown.	Green.	Sum of diff.
Pooling system	.279+	.129+	.069—	.339—	.816
Fat system....	024+	.126—	.186+	.084—	.420
Fat + 2 system...............	.112+	.037—	.097+	.173—	.419
Fat + casein system........	.008+	.041—	.061+	.028—	.138

(In the above tables the plus signs indicate the amounts the patrons received in excess of what they were justly entitled to and the minus signs indicate that they did not receive their share.)

If more accurate results are desired than obtained by the fat plus casein method, as illustrated, it will be necessary to multiply the fat test by 1.1 and the casein test by 2.5; add the two products together and use the sum as a factor in making the computations. Such a method would prove to be too laborious for ordinary use.

According to the fat plus casein method, the fat and the casein are placed on an equal basis pound for pound. This may be offered as a criticism against the method, but we do not think that the objection will hold inasmuch as it actually costs a farmer more to produce one pound of casein than it does to produce a pound of fat. A pound of casein removes more fertility from the soil than does a pound of fat and at the same time it is also more valuable to the cheese inasmuch as it is the casein in the cheese that really makes it so nutritious.

Taking everything into consideration we believe that we are entirely justified in placing as much value upon a pound of casein in the milk as upon a pound of fat. There will always be some slight differences, but we believe that this method comes nearer the real value of the milk than any other method yet proposed.

DISCUSSION.

The President: We have had a very interesting talk, gentlemen, and this topic ought to bring out lots of discussion. We have Professor Benkendorf here to answer any questions we desire to ask.

Before opening this discussion, I desire to announce that Mr. Carswell, the treasurer, will be at Room 78 of the Republican House, tonight from 7:30 to 9 o'clock to pay the pro rata funds.

Are there any questions you desire to ask Mr. Benkendorf?

Mr. Kasper: Has not the care of milk almost as much to do with the yield of cheese as anything else?

Prof. Benkendorf: I cannot tell. I think you can get more cheese from milk that is well taken care of than milk that does not receive good care for the reason that losses in the fat will not be so great. I am not a practical cheese maker, never made cheese in my life, but I understand that milk that is well taken care of has a better yield. I think any cheese maker will bear me out in that.

Mr. Kasper: If the factories would adopt that casein test, don't you think we would be back where we started ten years ago? Would it not have a tendency to have farmers breed cows with a lower per cent of butter fat?

Prof. Benkendorf: It would have a tendency to have farmers breed cows that would have both more fat and more casein. This test does not put aside the Babcock test in the least, we have it as well, the Babcock test to determine the fat and Hart test to determine the casein, and one would have to use both these tests to determine the value of the milk. We cannot put aside the Babcock test and adopt the casein test, we have to pay attention to the fat conent as well as the casein.

Mr. Anderson: Before you can apply this casein test, which do you consider the method nearest correct in paying for milk?

Prof. Benkendorf: You mean to ask which method is the most equitable for paying for milk outside of the casein test? I think the fat test is the nearest right. There are a good many objections to the fat test only and I have pointed them out in my paper. I showed that the amount of cheese made per pound of fat decreased as the milk gets richer and therefore one can make more cheese from 3% milk than from 5% milk, everything else being the same; but if we do not adopt the casein test I think the Babcock test is the best way to pay for milk. Combining the Babcock test and the casein test, we have an ideal way if we pay according to these tests.

Member: For instance, if a man had 500 lbs. of milk and skimmed it thoroughly by running it through a separator, he kept the skim milk on the farm, mixed the cream thoroughly with water until it tested 5% by the Babcock test, how much cheese could be made out of that? Skimmed milk is supposed to be worth 35c per hundred for feeding purposes, while water is very cheap.

Prof. Benkendorf: I do not think I understand the question.

Mr. Dassow: It seems to me the gentleman wants to make out the patrons want to cheat the cheesemaker by keeping the skim milk and casein at home.

Prof. Benkendorf: There is no doubt but with the Babcock test, when you add two to the test according to the Dean method, a patron would cheat the factory; but with the Babcock test and the casein test if water is added to the milk there will be but little butter fat content and lower casein content and the patron will not be paid a cent more for his milk than it is worth. If you skim the cream off your milk you are not going to get so much fat and although you may get approximately the same amount of casein in the milk you are not going to gain anything there. You simply take away the fat and if you add water to the milk you are going to cheat the casein.

Mr. Dassow: It seems to me the gentleman thinks if he takes the casein out he will cheat the cheesemaker.

Prof. Benkendorf: He will only be paid according to the casein.

Mr. Haven: We people from other states recognize the fact that Wisconsin is bringing in a good many new ideas to dairy work. You brought out the Babcock test and the casein test, and it seems you have a method for manipulating milk and cream, or at least it has been thought of, and you may have to fall back on the old lactometer test.

Mr. Corneilson: As I understand the gentleman, he thinks he can bring cream reduced with water to a cheese factory, and cheat the cheesemaker. That cannot be done. I would not give much for the services of a cheesemaker who did not know enough to see that was diluted goods if he offered him cream diluted with water. In such a case the cheesemaker ought to call an inspector and have the matter settled through the courts.

The President: I would like to ask, before we go farther, in removing the cream from the milk, how that man would expect the precipitation on the part of the rennet in that cream? Is it a possibility to precipitate cream with rennet?

Member: In manufacturing brick cheese, Swiss cheese and Limburger cheese during the warm weather our patrons bring their milk to the factory twice a day, the last coming generally about night fall. The patrons have no time to cool their milk down, they do not propose to cool their milk and you cannot cmpel them to do so, so that it comes to the factory at about 90 degrees. Well you are not going to put a thermometer in there if it is a little higher and you cannot take a lamp or candle and examine it thoroughly at night. With American cheese the milk must be cooled properly, as cream, being lighter than water, it will float on top the same as oil on water; but in Brick, Swiss or Limburger cheese the milk comes at practically the same temperature as it is drawn from the cow, and sometimes gets in as late as eight o'clock in the evening.

The President: In manufacturing Swiss cheese, the custom of delivering milk twice a day has become so common that it is the belief that the milk must be manufactured into cheese immediately after being drawn from the cows. This is not the case, nor is it necessary. However, the short time which elapses between the time the milk is drawn from the cows and when it is manufactured into Swiss cheese is hardly sufficient to develop any lactic acid, therefore it is not necessary to cool that milk; but Swiss cheese is very successfully manufactured in many places where the milk is delivered only once a day.

Under these conditions, however, the night milk is properly cooled and delivered in separate cans the next morning.

If there are no other questions we will close this discussion and listen to an announcement by Mr. Chas. Becker, of this city.

Mr. Becker: We have with us a gentleman by the name of Professor Martini who will entertain us a few moments, but I want to warn you gentlemen to look out for your watches. I take pleasure in introducing to you Professor Martini.

The convention was entertained for about half an hour by Professor Martini with slight-of-hand tricks, etc., which he afterwards explained, and which were very mystifying to the audience.

ELECTION OF OFFICERS.

MR. S. B. SHILLING called to the Chair.

The Chairman: Gentlemen, if we can have your attention for a few minutes we will soon dispose of this business. I want to say to you, before we commence, that it was with a great deal of reluctance I consented to take this position during the election of officers. I felt that it was presumptuous on my part, a man from another state, to step into the chair of the highest office of your organization, yet I feel honored to be permitted to preside over an audience of the size and intelligence of the Wisconsin Cheese Makers' Association and, as the hour is late, we are going to get down to business and carry on our elections as fast as possible.

The first office to be filled is that of president. Nominations are in order.

Mr. Aderhold: Mr. Chairman and Gentlemen: It is said that a fashion must run two years. It has been the fashion for the past year to have a strawberry blonde for president and that fashion has not yet run two years. Two years ago I had a strawberry blonde after me pretty hot and heavy; he had a strong following then and I believe he has yet, and I want therefore to place in nomination at this time the name of Mr. J. B. McCready, of Sheboygan.

Nomination seconded.

The names of Mr. E. A. Aderhold and Mr. Fred Marty were also placed in nomination, but both gentlemen declined the nomination.

The Chairman: Are there any other nominations? If none, I will declare the nominations closed and according to Robert's Rules of Order you may elect viva voce.

Votes being called for, Mr. McCready was unanimously elected president of the association.

The Chairman: The next office to be filled is that of vice-president. Nominations are in order.

Mr. Myers: You all know a gentleman who has been working among you for a number of years and has done exceptionally good work. He has been connected with the dairy and food department, was treasurer of your association for two years and vice-president for one year, and I honestly believe we can make no mistake in continuing him in office, I therefore nominate Mr. Fred Marty, of Monroe to elect himself.

Nomination seconded, and there being no other nominations vote was taken and Mr. Marty was declared elected vice-president for the ensuing year.

The Chairman: The next to be elected is your secretary. Who will you have to fill that office?

Mr. Sherwood: I nominate for secretary the gentleman who has served us so well the last several years, Mr. U. S. Baer of Madison.

Nomination seconded and election unanimous.

The Chairman: We now have the office of treasurer to fill. Nominations are in order.

Member: Mr. F. E. Carswell is one of the most conscientious, painstaking dairy workers we have in the United States, and I place his name in nomination for treasurer only regretting that I cannot nominate him for Congress.

Nomination seconded, and election of Mr. Carswell was unanimous.

The chairman: There is to be a director elected to fill the place of Mr. John Grootemont whose term of office expires. Will you please nominate a director?

The names of John D. Cannon and Mr. John Grootemont were both placed in nomination, and nominations duly seconded, and tellers were appointed to count the ballots, as election was by ballot. The tellers appointed were Messrs. Larson, Noyes and Becker, who reported sixty-six votes cast, thirty-six of which were for John D. Cannon, thirty-two for John Grootemont and one for M. Michels.

The Chairman: As this finishes our business we will now stand adjourned until tomorrow morning at 9 A. M.

FRIDAY MORNING SESSION.

Meeting called to order at 9:30 A. M. by President Michels.

The President: We have two numbers on the program left over from yesterday, one of which is Dr. Kletzsch and the other a paper by Mr. Benkendorf. We will first call on Dr. Kletzsch, of this city, to give us an address.

ADDRESS.

DR. G. A. KLETZSCH, M. D., Milwaukee, Wisconsin.

Mr. Chairman, Ladies and Gentlemen:

I came yesterday to your meeting with a great deal of hesitancy, not knowing what I wanted to say, or whether what I did say would be in line with your thoughts, ideas and interests; but, after listening to several of the papers of the afternoon, I found that I was directly in line and the thoughts that I had jotted down on paper were directly of interest to your worthy body, but before I commence I would like to answer a few of the questions that were put and a few of the statements made yesterday.

First, in regard to the statement made by Mr. Cook as to the success of the milking machine, I have had six or eight of the B. L. K. milking machines in use on my farm for a year and I can say that they are an absolute success. I know from experience that the milking machine is very much better than the average milker and that the objections to the machine are not well founded. For instance, one that I will pick out as to the drying up of the cows earlier than usual. That is not the case. I do not know whether the agents for the B. L. K. milker are here but if they are here they will be able to bear me out in that statement.

Another question asked by one of the gentlemen present was whether the age of milk had any influence on the casein in the milk, and I do not believe that question was answered as positively as it should have been yesterday. We deal with casein in our nursing milk every day in the year, and we know from experience that old milk does not give in quantity and quality the casein that fresh milk does and I can say from my own experience that the fresher the milk the more profitable it will be for you to use it, because of the quality and quantity; the quantity is diminished and the quality deteriorated by letting it stand.

Another point that came up yesterday was in regard to the casein test. I believe this is a very fine thing and I am glad to see again that the men connected with our university have come forward and I believe you gentlemen will appreciate that test more in the future than you do today.

The subject of the address which I was asked to hold before your worthy body was left to me for selection. At first, I thought I would make some remarks upon the bacteria which are found in milk under different conditions. But, after a thorough consideration, I concluded that for all that this is of great importance from the hygienic standpoint, it was not of that practical use to you which other questions might have. So I chose the broad subject of Milk and will relate to you my experience in its production and handling. Before I take up the practical part of my subject, I will make a few introductory remarks. Milk is one of the grandest products which Nature produces and, in consequence, the cow is one of the most useful animals we have. It is the only product of its kind upon which man can live indefinitely and exclusively, for it contains all the elements necessary for the upbuilding and sustaining of the system.

When in its natural form, Milk is the keystone to the health and welfare of the whole nation and it is a wonder that the method of procuring such an wholesome product has been nearly entirely ignored for thousands of years. We have already approached the twentieth century before the public has been aroused to the necessity of requesting the regulation of the production of such an important food article.

What is it, then, that requires such drastic measures and has lighted the flame which is agitating the whole world at the present day, It is because milk is not produced from healthy cows; it is not produced in healthy surroundings; is not produced from healthy feed and is produced in very unclean ways and, as before stated, does no incalculable harm brought to the market as a result of such untoward conditions.

It will, therefore, not be amiss to have such an important subject discussed by an outsider and to get his views on the article which forms the foundation stone of your productions. The composition of milk is well known to you all. That it is made up of Butter fat, Casein, Salts and Water, need hardly be stated. The layman thinks that the Butterfat is the most important part of the milk and if rich in this article, he considers the milk good. We all know that the casein contained in the milk is what gives to it its highly nourishing qualities. It is the Protein in the milk and upon this is based its food value. When milk is unclean, contaminated or highly infected with bacteria, the casein is the part of the milk which is affected and changed in its character. In consequence, its nourishing properties are diminished. Any growth of bacteria in milk is at the expense of the casein. It is, therefore, imperative to prevent such changes or run the risk of handling an inferior milk and getting inferior products out of it.

The first question which arises can a normal milk be produced? Is it within the reach of the average farmer and we can say every farmer, to produce a healthy product? Can the authorities who regulate other things request the compliance with certain conditions through which a normal milk can be delivered? Will such requirements produce hardship upon the farmer? Many more questions of the same sort could be put, but these are enough to illustrate what I wish to get at and that is that the requirements necessary for the production of a wholesome milk are not such, that they are not within the reach of every farmer who enters upon this particular branch of industry. The conditions which should exist on every farm where milk is produced and for whatever use it may be put to are the following:

1st, A healthy cow.
2nd, Sanitary surroundings.
3d,. Wholesome feed.
4th, Clean milking.
5th, Proper care of milk after produced.

These few requirements are not exactions but every farmer can comply with the same if he wishes to. It is not necessary that a revolutionary spirit should be introduced, but a general compliance with the above requirements should be sought for. It may be possible to bring about good results by appealing to the pride and conscience of the farmer, and if this is not possible, I do not see why the product of the dairy farm should not be graded and each farmer rewarded for the kind of milk which he produces. A thing of this kind cannot be instituted by the individual but must be required by the association, and I am sure it would be a step in the right direction for an association of this kind to adopt such measures. They certainly would find a hearty support of the public at large.

It is of the utmost importance for whatever purpose desired, to use the milk as soon after milking as possible. This is what we are obliged to do in the production of our Nutricia Nursing Milk. In this preparation we endeavor to have the milk as pure and fresh as is to be had. Old milk, unless kept very cold, undergoes so many changes of a bacteriological as well as chemical sort that the milk in its nutritive properties is changed and also in its chemical composition. In warm milk the bacteria multiply very fast; for their propagation they use up the best part of the milk. The excrements which they leave back are of a very poisonous nature and affect the good qualities of the milk in many ways.

Professor Backhaus of Berlin, Germany, a scientist of high repute, and who as a physician made the study of infant feeding his life work, originated, after years of toil, the process, which is used all over the world in making Nutricia Nursing Milk. In many cases and in many lands, Nutricia Nursing Milk takes the place of mothers' milk and is the nearest approach to breast milk which is possible to be had. A short description of the process employed might be of interest to you. For it is with the casein we deal and the changes brought about in it, that has made the results so marvelous.

The first requisite is a "whole milk," termed in Germany "voll Milch," which signifies that the product used must be milk and nothing more nor less. This means a normal product of a healthy cow, procured under sanitary surroundings.

The casein is the element which gives to the milk its nutritious properties. This is the part, however, which proves so hard to digest for the infant. You use the casein and get it from the milk by coagulating the same and precipitating it. We use a ferment and dissolve the casein, making the milk contain more soluble casein than ordinarily cows' milk contains. In mothers' milk there is normally a large percentage of soluble casein and hardly any insoluble casein. We endeavor to approach the normal mothers' milk as nearly as possible. After the action of the ferment on the casein, is completed, we then coagulate the balance of the casein left and remove it from the milk, so that the infant does not need to burden his stomach with this extraneous substance. In other words, I am allied to you in the use of casein, the only difference being that you work with the solid substance and I work with casein in a liquid form.

The process employed is as follows: In order not to make any changes in the other ingredients of this milk which are not wanted, the milk is skimmed by running it through a separator. The skimmed milk is then warmed to blood heat and the ferment added, which is allowed to act on the casein for thirty minutes. Then that casein which still remains undissolved is precipitated and removed from the whey in the form of a curd. To the prepared whey the cream is again added and the milk is ready for the bottle in which it is thoroughly sterilized, so that Nutricia Nursing Milk when properly prepared and put up will keep in a cool place for a long time. As the infant requires different qualities of milk as it grows older, we put up different grades to conform to its wants. The character of the different kinds simply differ in the amount of the nourishing matter present.

In order to get "whole milk," I established the Nutricia Farm at Theinville, Wis. There I endeavor to carry out the above stated requirements which are necessary to get a wholesome product. When I bought the farm, the present buildings were on the land and they were of the same kind as the majority of farmers have them. I simply changed the old buildings, and made them as sanitary as possible. My herd, which consists of a hundred cows or more of grades, is tuberculine tested by the State Sanitary Board. The feeds which I use is ensilage all the year around, clover and alfalfa hay and of the concentrated feed, bran and ajax food. My milking cows are stable fed all the year round. These now number about seventy and are milked by milking machine. The springers I keep on my annex farm adjoining the Nutricia Farm where the stable arrangements are the same, however.

I am not, however, in the dairy business for that alone. I wish to exercise an influence upon the farmers in my neighborhood to follow my methods in dairy farming. From experience, I know that the changes which are necessary to be made by the farmers in order to come up to the above requirements are not beyond their means to make.

Now I would like to sugest to this worthy body, that each of you in your respective districts exercise also an influence upon the farmers who supply you with milk, to make gradually such changes in their stables and with their herd in order to come up to the requirements asked for. And if these farmers who comply and deliver to you wholesome milk, designate their product as whole milk. In Germany, this term find universal application and has proven beneficial.

I should be pleased to have all of you pay the Nutricia Farm a visit and see for yourselves what can be done with regular farm buildings and herds. I will also be pleased to supply you and the members of your association with floor plans for the arrangement of their stables. I know, now, after having first had experienced architects, carpenters, masons and concrete mixers that the same changes can be made much less expensive by regular workmen, when I changed my annex farm only this fall to the form of the Nutricia Farm. If your milk suppliers would combine they could easily and with comparatively small expense, change their buildings and their herds gradually so that in a short time they would supply whole milk and with the modern arrangements, double their capacity and supply you with twice as much as you are getting today.

I have here some barn plans that are very suitable. A barn built on these plans furnishes accommodations for sixty-eight cows, and if the association desires I shall be glad to turn these plans over to your secretary and let him have photographs of this made, or I will have the photographs made myself and supply each of you individually with enough cuts so you can give them to your farmers so they can work on that plan, and I know it would be of benefit to them.

Mr. Dassow: I would like to ask the doctor whether it would be necessary to put boards on the cement floor where the cows lie?

Dr. Kletzsch: The floor under the cow is covered with concrete but on top of the concrete there are planks, and that is one thing I neglected to state and that is to be sure when you put in concrete not to forget to put in drain tile below. That is the most important thing I know of. I have had, as I said, a great deal of experience. I built a farm up North at Summit Lake, Wis., where we have our summer home and I have lost more money by the imperfect building of the barns up there in cows and a large number of pigs and poultry and sheep I keep, I have lost a great deal of money on account of the bad, moist condition of my concrete floors. At my farm near here I laid drain tile through each one of these roads, not only where the cows lie but also under the floors, underneath the feeding alley and right around, so I have eight or ten rows of three inch drain tile running from West to East, and you can stand in that barn, housing sixty-eight cows and two bulls, three or four box stalls filled with cows, and not have one particle of odor of the cow. It is not the ventilation in the ceiling that keeps it in that condition, it is the dry condition of the cement floor, and those cows are as healthy as they can be and they stand there day in and day out, with the exception of two hours each day when they are driven into a little park. I do not graze my cows at all, simply let them have a little airing. Where the cows lie there is planking.

Mr. Shilling: How far under the floor are the drain pipes laid?

Dr. Kletzsch: Just below the concrete. The concrete is six or eight inches. The drain tile must be in the ground because that is where the water collects.

Mr. Dassow: I would like to ask one more question. In our neighborhood the farmers are disregarding the planks under the cows. Their floors are dry but they are not having good results without the planks, although they have been doing that now for a year.

Dr. Kletzsch: Mr. Kickheffer, who has the Edgewood Farm, one of the finest in the world, has his old barns with the half where the cows lie planked and the other half concrete; but I believe the new barns he is building, one of which was completed last summer, have planking all the way through. I think he even discarded the concrete at the upper end and now makes plank all the way through.

The President: If there are no other questions we will go on with the program, and the next feature to be taken up is the introduction of your new officers.

Mr. Baer: First, Mr. Chairman, I would like to read a letter from the Citizens Business League of Milwaukee.

Milwaukee, Jaunary 8, 1908.

Wisconsin Cheese Makers' Association, In Annual Convention,
Milwaukee, Wisconsin.

Gentlemen: Again the Citizens Business League has the pleasure of extending to you a most cordial welcome to the city of Milwaukee for your annual convention and again, we take pleasure in asking that your next convention be held in this city. We are convinced that the very satisfactory conditions under which your conventions are held here, the marked growth in your membership and the growing interest in your association has demonstrated the peculiar fitness of Milwaukee as the place in which to hold your annual sessions. We beg to assure you that as in the past we shall always take pleasure in co-operating with you to make your conventions here successful in every respect. We wish your association continued prosperity and all of your members a Happy and Prosperous New Year.

Yours very truly,
CITIZENS BUSINESS LEAGUE,
R. B. Watrous,
Secretary.

INTRODUCTION OF NEW OFFICERS.

MR. CHAS. BECKER, of Milwaukee, Chairman of Committee.

Mr. Becker: Mr. President, Ladies and Gentlemen and Cheese Makers of Wisconsin,—There has been a committee appointed, and it seems the committee has done me the honor of allowing me to introduce your new officers. I take great pleasure, therefore, in introducing to you the man who has been elected to serve as your president for the ensuing year, I take pleasure in introducing to you Mr. J. B. McCready, of Sheboygan.

REMARKS.

J. B. MCCREADY, Sheboygan, Wis.

Mr. Chairman, Ladies and Gentlemen:

I do not know that I need an introduction to the cheese makers of Wisconsin. However, I appreciate the kindly manner in which Mr. Becker has introduced me and I wish to say I believe I know the majority of you and those whom I don't know I want to get acquainted with. It will be to our mutual advantage to be individually acquainted. I would be glad to have any one who does not know me come up to me and call me "Mac," for that's my name usually when I am at home, and if I am acquainted with you you will have an opportunity to tell me your likes and dislikes, and your little troubles. If I can help you in any way I shall be only too glad to do it.

I do not think there is a man in the audience who is not well acquainted with "United States" Baer. That is one of the advantages he has and that is one of the secrets of the success of this organization, that he is personally acquainted I believe with every member, and it gives him quite an advantage. I want the same advantage.

If I were satisfied that this was the most important office in your institution, I would be rather chary of accepting it but I know it is not; the most important position is filled by the best man in Wisconsin for that position, your secretary. All I can do is help him and I am going to endeavor to help him to the best of my ability.

We have a membership, I think, this year of over five hundred; I want to see it just four times five hundred while I have anything to say in the matter. I know there are at least two thousand cheese factories in Wisconsin that must have two thousand cheesemakers, and it is pretty nearly time that the cheesemakers in this state were putting a little money to one side, if it is only their tobacco money say one day a week for fifty-two weeks, in order to come down here once a year. I think every member here will return again next year; try and bring someone else with you. Get them to come quietly if possible, but if they will not come that way take a club and drive them. After you get them here we will keep them.

In closing, I want to thank you all for electing me to this office. I trust and hope I will be worthy of the confidence you have placed in me; I shall endeavor, at any rate to feel worthy of that trust.

Mr. Aderhold: How about the blonde hair, Mac?

Mr. McCready: Mr. Aderhold I want to thank you for your kind remarks about the strawberry blonde. They tell me that about every ten years blonde hair is in style and after it becomes the style it remains in for about five years. That is what they tell me. However, mine is fading and I believe that probably one year will hold me.

Mr. Becker: I take pleasure in presenting to you next a man you all know. He has been your vice-president for one year and now you have placed him in office again. I take pleasure in introducing to you Mr. Fred Marty.

REMARKS.

FRED MARTY, Monroe, Wis.

Mr. Chairman, Ladies and Gentlemen:

I can only say again that I thank you for the honor you have done me in electing me once more for vice-president. I assure you that anything I can do for the association I shall gladly do. Being elected once more puts me in mind of a story:

At one time there was an army marching over the plains, commanded by a certain general. In some way they had strayed away from the fort which was their destination, and did not know exactly where they were, so finally they asked a man whom they met how far they were from this fort and he said "About four miles straight ahead." They kept on marching and after they thought the four miles had been covered and still they could not see the fort, they met another man and asked him how far it was to this place they were seeking and the answer was "Four miles straight ahead." The general kept on marching his army and after marching a couple of hours, with still no sign of the fort, he met a third party and asked him how far it was to this fort, and still the reply was "About four miles straight ahead." Turning to his army the general said "Well, boys, thank the Lord we are holding our own." That is my position, I am holding my own. I thank you.

Mr. Becker: We have now a man who belongs to us, U. S. Baer, our secretary. I take pleasure in introducing to you Mr. Baer.

REMARKS.

U. S. BAER, Madison, Wis.

Mr. Chairman and Gentlemen:

I don't know how long I am going to stand for all these bouquets that have been thrown at me. I am not a speaker, as is your president; I am not good looking, as is your vice-president, and a whole lot of this credit that has been given me largely belongs to the men behind the gun. I have been extremely fortunate in all the years I have served you, including this last year especially, in having a wise man as president, at the head of the organization, to give me counsel and advice. All along the line the officers of the association have always given me most excellent advice, counsel and assistance.

I certainly appreciate the honor you do me. It is hard work. It has been expensive work for my pocketbook for a number of years in a way, but yet, as the meetings grow larger and as the enthusiasm grows and the fame of this organization becomes greater, I feel more than amply repaid, and I today realize that I never before have been called to the discharge of any duty which requires a more conscientious exercise of all that is in me than this. I assure you that I shall try my level best to give you better service this coming year than I have ever done before. I want to remain yours to serve for 1909.

Mr. Becker: We have another officer with us, you all know the fellow that gets your dollars. I take pleasure in introducing to you Mr. F. E. Carswell.

REMARKS.

MR. F. E. CARSWELL, Richland Center, Wis.

Mr. Chairman and Gentlemen of the Convention:

As you all know, I am not a public speaker and I am not here to make a public address, but I do thank you sincerely for re-electing me as treasurer. This position came to me unexpectedly a year ago and you have seen fit to retain me in it, and I feel very grateful for the compliment. I am glad to serve you to the best of my ability. This association is growing larger and stronger, more renowned and we are famous. I trust that another year, with the accommodations that we will receive here in Milwaukee, that this association will be half as large again as it is this year.

I do not know you all personally but I believe a good many of you know me because I have been after your money, but those of you whom I don't know I want to come and make themselves acquainted and I shall be pleased in any way I can to assist you. Gentlemen, I thank you.

The President: We will now call on Mr. Benkendorf to explain to us a new Method for Determining the Moisture in Cheese.

A NEW METHOD FOR DETERMINING THE MOISTURE CONTENT OF CHEESE.

Prof. G. H. Benkendorf, Madison.

Mr. Chairman, Ladies and Gentlemen, Members of the Convention:

Your secretary thought it might be interesting to the members of the convention to explain to you what is termed the Wisconsin High Pressure Oven. This oven was designed to determine the moisture in butter. Little attention was paid to the cheese side and in fact I have made very few determinations for cheese moisture. I do not know very much about cheese making and I do not know whether it would be at all advisable to advocate trying to incorporate more moisture in cheese. I think it would be in a way detrimental to try to incorporate more moisture in cheese than the cheese normally would hold. However, that is for the cheesemakers to determine themselves. This method was designed for determining the moisture in butter and practically the same way will determine the moisture in cheese.

This particular oven was manufactured by the Creamery Package Manufacturing Co., of Chicago, but other ovens are also made. We have had some made by King and Walker, of Madison, so I do not want to exactly advertise this oven but I want to explain how it is made and you can determine the principle.

The chemist, when he makes a determination, takes a small sample and places it in a water bath. This has to be at 212 degrees F. A determination for butter takes several hours and by using a water bath for cheese it will take sometimes two and three days to make a determination that is at all accurate, that is it takes about two days of having it placed under the water bath before the water will be evaporated. With this method it only takes a few hours. The reason this method will evaporate the water faster is because a higher temperature is used. As I said, with the water bath the temperature is 212 degrees but with this method a temperature of 250 or more is necessary.

The principle on which it is founded is very simple. You have all heard the story that if you go up the mountain the higher you go at a lower temperature the water will boil, that is if you go high enough you cannot cook coffee, the atmosphere is so light. The reverse is true, if you put water under pressure, the higher the temperature required to boil it. At low pressure the water will boil at 200 degrees F., at 5 lbs. pressure it will boil at 215 or 216 degrees, so if you go to 60 lbs. pressure you have a temperature of 270 degrees F. and, inasmuch as water will evaporate at 212 degrees, you can easily see the water will evaporate very readily.

On this particular oven, we have a plate below and a plate above connected with a pipe and these two plates are set so they will stand 100 lbs. pressure, and we connect steam here and have the steam pipe running off there. In this way the part in here (illustrates) will be under steam pressure. Then by having live steam under pressure you have pressure of 270 degrees. This part here (illustrates) is not under pressure and the small plates are placed inside with sample and will evaporate very readily.

In order to make a determination, a cheesemaker will take a sample of cheese or butter and weigh it out. Say we weigh out ten or fifteen grams in this small aluminum dish and put the dish in the oven. You can make four or five determinations, if you care to, at once. I have made as many as fifty or sixty determinations of butter at one time. All you have to do is to weigh the sample in this dish, put it in the oven, turn on your steam and go about your work. After a while you can take it out and weigh your sample again and the difference in weights will be the amount of water evaporated; then if you care to, you can put it in the oven again, leave it there for a while and then weigh it again to see if there is any further loss. After a while you will know just how long it will have to stay in the oven, about two and a half to three hours will tell the story. Sometimes it depends on the temperature, if you have a higher temperature it will not take so long, and after your sample is done you weigh it and the difference will be the amount of water evaporated. the per cent of which can be easily obtained.

Now there are no patents or royalty on this. It is given freely to the public, anyone can purchase it and use it. It has given very good satisfaction in testing cheese; we have made quite a number of determinations and we come within a close per cent of the amount of water in cheese. Of course if you do not want to incorporate any water in cheese, which I hardly think it is advisable to do, I do not know that it is going to be of much value to you, but if you want to determine the moisture in cheese here is a method you can use without much bother. It is simple, has no chemicals, glassware or anything to bother with and it will last a long time. If anyone would like to ask any questions I am free to answer them.

DISCUSSION.

Mr. Cornielson: How is the sample of cheese taken?

Prof. Benkendorf: As I have said, I have never made many determinations of cheese. I have worked mostly with butter but Mr. Michels has made all the determinations for cheese in the scoring exhibitions and can probably answer that question better than I.

President Michels: I spent a number of weeks trying to find out which would be the best way to take a sample of cheese. I was told and believed at first that there was quite a good deal of difference in the amount of moisture in different parts of cheese and especially in cheese that had been laying on one side, that the lower side would contain the most moisture. I tried a good many ways and even with the Long Horns that were resting on one end for two weeks I found no difference in the top or lower plug, that is a plug taken from the bottom and another taken from the top of the cheese. The way I sampled all of them was to take a simple cheese trier, take out a plug and put ten grams in one of the small dishes, put the sample in the oven until it turned brown. It takes some experience to know when the moisture has all evaporated; it is quite hard at first but one soon gets accustomed to it and by keeping close watch of the oven one can easily see when the moisture has all evaporated.

Gov. Hoard: By what process would you determine if cheese was lacking in moisture?

Mr. Michels: I find the average good cheese has a little more than one-third moisture.

Gov. Hoard: By what process would you determine if the cheese was deficient in moisture?

Mr. Michels: The same process would show. We have had some that contained a trifle over 32%.

Gov. Hoard: It would seem that we need some process by which we could determine quickly if the cheese was lacking in its proper proportion of water. Would this determine that?

Mr. Michels: This can only be used after the cheese is made up.

The President. We are very glad to see Ex. Governor Hoard in the audience this morning and we would like to hear from him at this time.

REMARKS.

HON. W. D. HOARD, Fort Atkinson, Wis.

Mr. President, Gentlemen of the Convention:

You take an old fellow like myself that was in at the birth of this state, in 1872 saw the cheese industry consisting of a few factories, and now look over the situation and see such a convention as this which this industry has evoked, and I might almost say with Stephen of old "Now, Lord, let Thy servant depart in peace for he has beheld the glory of the Lord." It is a remarkable contrast in my mind.

I remember with keen recollection my first effort to establish cheese factories in Wisconsin; I would go out in the school districts and talk to farmers, trying to get them to organize, and from that day to this the same principle has been holding good, the proposition of organized knowledge. The difficulty with the farmers and cheesemakers and the people of Wisconsin in 1872 was there was no organized knowledge, there were no organized minds, there was no organized study. I was a cheesemaker and a butter maker from my youth up in New York. I came to Wisconsin in 1857 and I might almost say that the average person in the state would hardly know a cheese if he met it in the road, and sometimes it could be found moving along very well. From that day to this the great struggle has been in the mind of the individual, the mind of the cheese maker, the mind of everybody connected with this industry to establish a clear organization of judgment and understanding. To do that your humble servant worked to the best of his ability, and we have today a state that stands without a peer in this Union or on this continent in the several points of its excellence. I will enumerate. We have the best dairy school in the United States in Wisconsin, we have the best bulletins, the best experiment station, the best dairy and food commission and I drew the bill originally; we have the best organizaions in its butter makers' association, its cheese makers' association and its dairymen's association. Your association is without a peer, and we have the best progress of any state in the Union. It is a proud picture to look at and I want to congratulate you young men, for I see before me mainly young men. I remember of reading in the old Sanscrit literature this thought from a Persian author "Wouldst thou search in the book of prophecy for the fate of mankind read it in the faces of the young, for in them it has unfurled the coming of the years." Now I read in your faces. I am an old man, past seventy-one years of age but with a heart still young. My wife says that anybody can tell who has had the trouble of bringing up the family when they look at her hair and mine. She is a very knowing woman, and like most good mothers she is very close to the truth, but I have grown old in the service and I have never been able to do one hundredth part of what I wanted to do. I have never been able to create that degree of interest right back at the beginning of the industry, on the farm in the hearts and minds of the farmers, that I wanted to do.

In my lecture work in Canada and in the Eastern states, in particular, I have always found the people were looking to Wisconsin for future triumph, future discussion, future influence and future progress in great dairy interests of this country. It is a tremendous interest, gentlemen. We have a right to be proud if we are identified with it and I think there is no garter of knighthood or accomplishment in this nation that is of a higher degree of distinction than to stand steadily by the progress of agriculture, and particularly of dairy agriculture. I want you to feel proud, I want you to feel encouraged, I want you to feel elated with hope. Now we find that the great department of agriculture at Washington is coming to an understanding of the magnitude of this great industry and they see, men of genius and intelligence like President Roosevelt and others, men of broad minds and clear understanding, that the hope of this country lies, as James J. Hill and Samuel Alderton said in a recent number of the Saturday Evening Post and Mr. Hill said to me personally, that the hope of the nation lies not in its manufacture, not in its capital, not in the many lines for money that many men are following, but away back in the interests and understanding of these people, viz. in agriculture.

You are a part of the agriculture of this state. I do not want you to think you are cheesemakers alone, don't let that narrow view point govern your profession; make your profession just as effective as you can but consider that in you, in your cheese factory and in the creamery is a little common school. If we had a map of Wisconsin and a little dot was made for every school house in the state we would have a picture at once of the central propositions that are at work for the enlightenment of our people. The little district school of the state is the foundation of all its culture and education. I happen to be connected with the University of this state as one of the Board of Regents of that great institution. Connected with the University is the college of agriculture, one of the most efficient and best in the world. Sir Henry Plunkett, of Ireland, was visiting here the other day and said he did not know of any college in the world that exceeded in usefulness to mankind the college of Wisconsin. High praise, for he is one of the most knowing men in Ireland or in the British Government. He went to Madison and addressed the boys; he talked to them on the great value of corporation, and what it meant, no more or less than the value of organized effort. It is said that "Birds of a feather flock together" and you will notice the value of that proposition of flocking together, coming together for common agreement, working together, in other words the principle of co-operation. It is due to that you are here today, proud representatives of this great industry.

Now you have a continent, you have an empire, you have this great North to civilize, organize and develop, and I want to say to you that no fairer heritage lies before the eyes of men today than Northern Wisconsin has, relating to the cheese industry. It is going to be a wonder to the world some day. Now, gentlemen, take heart and courage to yourselves and above all things do not think that in your relation with each little circle of farmers your duty is done, that your duty is done when you have made their cheese. Do not think that. Thousands of those men are weak, thousands of them have no knowledge, thousands of them are disorganized in their thought. Organize them, promote them, encourage them. Take the creameries of this state.—I have spent over four thousand dollars taking cow census for these United States from the Atlantic Coast to the Missouri River. In twelve of those states, hurrying over the foundation work, of men who have kept cows and sent their milk or cream to the creamery for a year, nearly 45% of those farmers read not one single page connected with dairy literature, made no study. Just the same in cheese factories. The same percentage will exist there. If a man has sufficient brains with which to do his work on the farm he ought to have mind sufficient to be a student, and a reader and a thinker on these questions.

The trouble all over Wisconsin is a lack of study, a lack of thought, and you are right where you can stimulate thought. Every man among you can be a missionary, every cheese maker and buttermaker can be a teacher, if he will, to the men about, and that will be your greatest glory, that will be the theater of your best efforts, not alone that you will make good cheese but that your influence is felt clear out to the humblest man that brings milk to your establishment.

I have said repeatedly that if every cheese factory and creamery in this state would take a cow census once at the end of the year, show up to every patron just the difference skill and intelligence and the lack of it in the money that comes back to him, it would create a wonderful revolution in Wisconsin. The cheese factories and the creameries are the repositories of that knowledge; you hold it. Have you ever talked to your patrons? Have you ever shown them the difference between A, B and C clear down to the end of the alphabet? Have you ever tried to induce your patrons to take a clear cut census of the cows that supply milk to your factory, showing the difference between them? You can do more than anybody else to stimulate and encourage the industry among those men if you do that.

Gentlemen, I congratulate myself that I am still able to stand up and look you in the face and bid you God speed in your good work.

The drawing for the car of coal, donated by Mr. Chas. Becker of Milwaukee, then took place, the car being won by Mr. Oscar Knutson of Spring Green, Wis.

The President: Hon. Thos. Luchsinger, of Monroe, is here at this time and will give us a talk on the Foreign Cheese Industry of Wisconsin.

THE FOREIGN CHEESE INDUSTRY OF WISCONSIN.

HON. THOS. LUCHSINGER, Monroe, Wis.

President Southern Wisconsin Cheese Makers' Association.

Mr. President and Gentlemen of this Convention:

I have been called upon by your Secretary, Mr. Baer, to make a few remarks about the Foreign Cheese Industry of Southwest Wisconsin, and the kinds of cheese made in our territory and for one of which we enjoy a celebrity and reputation second to none, for the reputation of Green County's limburger is world wide and wherever we go we meet with that odor that reminds us of Green County fully as much as an orange or an orange blossom will bring home to the citizen of Florida or California recollections of his native state.

If we wish to explore the territory of a river, we usually begin at its mouth and follow its course to its source, which I propose to do today; also I know that the time allotted to me will not be much more than necessary to properly introduce my subject.

About ninety miles west of Milwaukee on the Mineral Point Branch of the C. M. & St. Paul Railroad, there is a fine little city called Brodhead, situated on the Sugar River, which rolls its quiet course through the eastern center of Green County, traversing it from North to South. Along this river runs a branch of the same railroad, which is called the Albany and New Glarus Division, and I propose to you to take a ride with me over it to its terminus, New Glarus, about twenty-four miles north. New Glarus, in which only a few years ago, everything, the houses, the people, and speech, reminded you of Switzerland, is today a pleasant village of about eight hundred inhabitants, which differs in nothing from the common American village of its size, excepting by the magnificence of its buildings both public and private; fine churches, banks, stores, and a host of fine private houses immediately remind you that you have struck a center of wealth, and public utilities are not wanting. Municipal light and water works are there, and the time is not far away when a network of street track, together with an interurban road to Monticello, six miles south, will make New Glarus an ideal country village . When you look over the landscape, the thought arises within you, what has caused all this wealth and appearance

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of plenty? High, steep hills, narrow valleys with a small river or creek meandering through its tortuous course, it cannot be farmed in the true sense of the word, for these hills cannot be tilled, because the rains and snow would wash the humus away, so it must be something else which has worked all this wonder. There are no mines or factories, there is no water power of any magnitude to invite such, and therfore we must seek elsewhere for the source of this apparent wealth. Sixty-three years ago, a number of colonists were settled by the Canton of Glarus in Switzerland on the land surrounding the village of New Glarus. Twnty acres of land were allotted to each of these colonists, and which twenty acre piece, as the quaint instruction reads, which was given to the parties who were sent ahead to select this land should contain tilling land, hay land, timber and water. This was a hard task, and a hard quest had these select men, until they found what they wanted. Sections fourteen, fifteen, twenty-two and twenty-three, and parts of twenty-five and twenty-six, Town four north, range seven east, Green County, Wisconsin, were chosen, and a rugged, hilly spot it was, and many Americans, some of whom were settled in the Neighborhood, made it the subject of their jokes about this choice of the so called "Experts", as these select men were called. But they chose better than they knew, for these very hills and dales which reminded the colonists of their native foothills in the Alps, held the very substance and forces of nature which in after years became so valuable to them. Among the colonists were some who had been herders and dairymen in the old country, who had spent their short summers on the Alps, earning a scant living at herding cows which they rented from the people in the valley, and made their cheese and butter from the milk derived from the short but sweet grass of the Alps, and one or two of them were expert cheese makers. As soon as these owned a cow or two, they thought of the swiss cheese which they made in the old country and commenced to hanker after it as the Israelites did after the flesh pots of Egypt. They wondered if the American milk would also make cheese. They knew how to procur the rennet from a calf's stomach, their wash boiler had to serve for a cheese kettle, the nearest hickory or swamp burroak furnishd the hoops, which they well knew how to make, and the swiss cheese industry was born. A few more cows added, a copper kettle procured the world knows from where, later on some were imported and others procured in the state of New York, and later on from the state of Ohio; but at first the old wash boiler for years held its place and position. Soon other colonists and settlers followed from Switzerland and among them some more experts in cheese making, and soon a half dozen or more little farms existed where swiss cheese was made. At first the cheese was all consumed in the settlement. Not all the Colonists, but only a small fraction of them being cheese makers, they naturally called upon their neighbors who were, and either bought their cheese, or delved into the mysteries of the art until they too commenced to utilize their milk and did the best they could. I remember my own grandfather trying his hand at it, making what he called Swiss cheese, which by January got so hard that if we wished to get a piece for breakfast we actually had to split it off from the small loaf with an axe.

As cows multiplied there was more cheese made, and of a larger mold, and a market was soon found for it at Galena, Freeport and Madison, and the more German a population of a city, the better was the market.

Packing was not very elaborate. Wagon boxes lined with fine sweet-smelling hay was all that was used. Into that came a layer of cheese, when the first layer was complete, hay was again laid on top, then another layer of cheese, and again a layer of hay and on top of that a few blankets or quilts to keep the hay from blowing off, and that was the entire outfit, and the industry of Swiss cheese making had been founded and commerce therein started and was destined to stay.

For twenty years nearly it remained in this state, excepting that copper kettles took the place of the wash boilers, and out houses were used for factories, and if the cellar under the house was too small for the output, then an extra cellar was dug into the hill side and covered with earth.

But you must keep in mind that only a few of the original settlers, and but a few of the newcomers were initiated in the handicraft and science of cheese making, and only a few derived benefit therefrom. The rest of the Colonists farmed and tilled their lands, raised wheat as long as the soil was ready and willing to produce it, but when they gave out they were at their wits ends and in a sorry plight on their steep and stony hill farms. But whenever a calamity is greatest, help is near, and it appeared in a couple of cheese men from the east, whose names deserve to be on record forevermore, Gerber and Neumeister. They saw that the country was ready and ripe for a change and just what was needed. The high hills, giving a sweet and nutritious grass, which would produce the best of milk for their purpose, and they built a few factories and bought the milk of the farmers, which so far had been almost worthless to them, as butter brought but poor returns, and these men advised the farmers to purchase more cows and become dairy farmers instead of wheat growers. They were not slow to take their advice, because necessity compelled them to do something. Others followed Gerber and Neumeister, cheese makers commenced to flow in from Ohio and New York and then from Switzerland itself, and cheese factories, at least what represented and what was meant for such, sprung up at every cross-road like mushrooms after a rain, and the inevitable happened, for these factories produced more cheese, especially limburger, which was introduced and was then almost unknown, than the limited market could consume, and a great reduction in the price of cheese, and consequently of milk, took place, which, however, struck the cheese and milk buyers more and harder than the farmers, and proved the financial ruin of more than one. This time in the 70's is know as the panic in the cheese industry of Green County, and will be remembered for a long time by quite a few cheese makers and milk buyers who lost their all in that first hard blow.

But our industry did not die out as some predicted. From that time on the cooperative system came into practice so that today that is the rule, and milk *buying* the exception, and the time when one milk buyer operated from one dozen to twenty and more factories within our county is of the past. The most of the milk which is bought within our county is by some practical cheese maker who works up his own milk. Still there are a number of milk buyers who buy a few factories, but the number of cheese dealers is Legion and proves the magnitude of our present industry better and stronger that mere figures and statistics. Suffice it to say that not only the Swiss of Green County, where they are the predominating nationality, but the American, Irish and Norwegian have followed the example of their Swiss neighbors and the Irish of Lafayette County and Norwegians in the Southern part of Dane County, the Pennsylvania Dutch of Northern Illinois were not slow to follow.

The official statistics are far from being correct, and it would be necessary in order to be accurate and correct to take a special census of cheese factories and their products in those counties named. A very conservative estimate by one of the cheese dealers who is well posted in this matter by the nature of his occupation gives his estimate that there are over four hundred fifty cheese factories in the territory embraced by the Foreign Cheese Industry, and gives the number of pounds of cheese as estimated by him at forty million pounds, and the returns from same at about $4,250 000.00, which is much nearer correct, a wonderful growth indeed. Giving employment to from twelve to fifteen hundred men, to say nothing of the thousands of farmers who furnish tho necessary milk and all becoming well to do, as the fine buildings, residences and barns, are the best evidence.

This is what the Foreign Cheese Industry has done for Green County and its vicinity. That it is going to stay is another fact, and the past season is a good proof of that. When prices went sky high so that conservative dealers became alarmed and feared that it was a boom created by some unknown agency and that just as brilliant as the boom was, just so much dejection would come when the inevitable reaction would set in, but fortunately they were agreeably disappointed. And what is the reason that the prices did not drop as far as these men feared? It is this that while only a few years ago brick and limburger cheese were almost unknown in a good many localities of the United States, and only the better class of stores and saloons of the larger cities had it on their bill of fare, now every hamlet and village of any size in the United States from Washington to Maine and from Minnesota to Florida has some one or more places where it is not only kept, but sold; and where there were but a few dozen persons acquainted with this cheese, there are now hundreds of consumers, and the demand gets larger as the years roll by.

But we cannot expect to keep it all in Southwest Wisconsin. Jefferson, Dodge, and Winnebago Counties have manufactured this cheese in large quantities years ago, especially brick and limburger, and Northern Wisconsin has also through emigration from Green County commenced to manufacture, and a number of factories are springing up there, and in Minnesota and Iowa we have our competitors. But still the old hills of Northern Green County, southern Dane and Iowa, and the entire east portion of LaFayette County, can naturally be considered nature's store house, where the materials grow which are necessary for the making up of a fine flavored Swiss cheese, and the Swiss people who still manufacture over ninety-one hundreths of it are still the people who can be depended upon to produce the best article, which, as is conceded, can be safely put side by side with the imported Swiss cheese without having to be ashamed of it, if it is well tended, cured and ripened. While we have learned a good many things in the United States which have been of great benefit to us, we have also adopted some which are not puite so beneficial, and foremost among them is great hurry. Swiss cheese, like no other, must have special care in its curing and tending. While, of course, the grass and the milk produced from it is a great factor, and the utmost care taken in the making process just as necessary, but the same care, if not more, must be given to the curing process, and unless the latter is well attended to, and the cheese left to ripen in the right temperature, it will be spoiled in the transportation and by the hurry by which it is put on the market. One of the reasons for this hurry is that the farmers want their money, the cheese maker his wages, the cheese dealer quick returns from his investment. Our cheese factories being too small, we must do something with our surplus, and unless we have a cold storage, we are not able to take care of it as it should be taken care of. Some attempts to procure cold storage for Monroe, Brodhead, Monticello and New Glarus were attempted, but without success. I will readily admit that a good deal of good milk is spoiled by unskillful cheese makers, who are not well enough skilled in their profession, and our farmers and cooperative dairymen often hire this class of men for the cheapness instead of the skill. We have tried to remedy this by a union of the cheese makers among themselves for the purpose of examination as to the necessary qualifications, but wonderul to relate we meet with the heaviest opposition by the farmers whom we are trying to benefit thereby. One farmer said to me the other day, "Are you really going to give us guaranteed cheese makers?" I said, "Yes". Then he asked, "Are the cheese makers going to guarantee their cheese?" I said "Yes, upon one condition,—that you farmers guarantee your milk."

We are trying our best in an humble way to do all we can to keep the foreign cheese industry at the high water mark, but there are a number of things which are still necessary, better

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factories, better roads, better accommodations and conditions for cheese makers cold storages so that the surplus and overflow of the cheese cellars can be stored and brought to a condition of full ripeness for shipping and a host of other things which we are working hard to remedy and bring about reform. We have accomplished a great deal. A number of those old broken down shanties and mud holes called cellars which were formerly used for factories are disappearing fast, and fine modern structures are taking their place, worthy of the industry which they represent, and which gives life, wealth and pulsating commerce to all our community.

Now, gentlemen, one last word in conclusion: while we are in honest competition with each other to a certain extent, we are no more so than the farmers, one of whom raises beef, the other pork, and the third mutton. Variety is the spice of life, and when we tire of one kind of cheese, we like to get hold of another kind. Therefore, we are all working for the same purpose, and let us all make a strong pull, and a long pull and a pull altogether, and we will be able to keep Wisconsin on the map as one of the greatest, if not the foremost, dairy States in the Union.

The President: Mr. Luchsinger has certainly given us a very interesting and instructive talk at this time. We will now call on Mr. Peter Zumkehr, of Monroe, to give us a talk on Limburger Cheese Making.

LIMBURGER CHEESE MAKING.

PETER ZUMKEHR, Monroe, Wis.

Traveling Cheese Instructor for Southern Wisconsin Cheese Makers' Association.

Mr. Chairman, Ladies and Gentlemen:

About fifty years ago, when times were hard for the farmer, when he could raise only very poor crops, and market conditions being poorer still, the thought came to some farseeing farmers, that the dairy industry would be the ideal industry for southwestern Wisconsin. They started to make cheese, first only on a small scale. Soon the product found ready market, co-operative factories were built and the industry spread out until today, it reaches far beyond the borders of the great state of Wisconsin.

In other countries, especially in Switzerland, cheese making is so old, that it is almost impossible to find a true history of its history. Some scientists even go so far and claim, that the first cheese was made in Switzerland in the year of 1200 before Christ.

I will not take up valuable time in discussing the history or the origination of cheese making, but will turn to my subject and tell you how this cheese is made today.

Limburger is a sweet curd cheese, it is largely made in sections, where there is lots of low land pasture. Now what are the main features to be observed in the manufacture of finest Limburger cheese? The first is a pure milk supply, the necessary utensils for manufacture, a maker that thoroughly understands his business, a curing room where the temperature can be controlled.

To make a high scoring cheese you must have your milk in first class condition, all milk that is not, should be returned. Having your vat of No. I milk, it is heated to a temperature of about 94 degrees, enough rennet is added to curdle the milk in from twenty to twenty-five minutes, according to the season of the year. The curd is ready to cut when it splits before the finger, it is then cut in much the same way the chedder cheese makers cut their curd, it is left in this condition for about 3 or 4 minutes, then it is stirred for about twenty minutes it is at this point that the cheese maker demonstrates whether he is master of his business.

A good many makers are making a great mistake by not working the curd long enough before turning on steam. A better bodied cheese can be made when the curd is worked slowly and time is taken in getting it firm and the loss of fat in the whey will not be as large as when the process is hurried along and the maker tries to firm his curd by applying too much heat quickly, we are having too many of those Union men in factories now. Steam should always be turned on slowly, it should take from 15 to 20 minutes to heat the curd up to 98 degrees, according to the conditions of the curd. The curd is stirred in the vat until firm enough to dip, it is hard to explain, how firm a curd should be at time of dipping, but a cheese maker must know this from his experience. When firm enough, the whey is drawn off and the curd is dipped from the vat into moulds, which are 36 inches long and 6 inches wide, then the cheese is put in the cellar on a draining table, it is left on this table nearly 24 hours and during this time it is turned three or four times.

Some makers remove it in 12 hours from the draining to the salt table, but in most cases the cheese is not ready to be salted in that time. The cheese is cut into blocks 6 inches square and then the salt is applied to it. The cheese is salted usually three times, but I recommend salting it four times. I consider the salting the most important work after the cheese is made, I will not go into further detail of what effect too much or not enough salt will have on the cheese, but shall be glad to give my opinion in answer to any question which may be referred to me.

From the salt table the cheese is placed on the shelves and set on their edges, it is rubbed and turned every other day until it is ripe enough to pack which in most cases requires almost one month.

When the cheese is getting ripe, the color changes from a white to a reddish yellow. The temperature of the curing room should not go above 65 degrees, except in the room where the salt and draining tables are kept.

If cheese is cured at a high temperature it will be at the expense of the quality and the curing rooms are in many instances responsible for the poor grade of cheese, which are placed upon the market.

The cheese is packed in parchment paper and then in tinfoil and is then placed in boxes and it is ready for shipment.

DISCUSSION.

The President: Do you wish to ask Mr. Zumkehr any questions in regard to this subject.

Mr. Parkin: How much rennet do you use for a thousand pounds of milk?

Mr. Zumkehr: From three to four ounces.

Mr. Doane: What is the effect of over salting? Does it have any effect other than on the taste?

Mr. Zumkehr: The cheese will not ripen as well as otherwise. It will also spoil the texture, make it dry and crumbly.

Mr. Parkin: About how much time do you take for setting and dipping, as a rule?

Mr. Zumkerhr: The time taken from setting to dipping depends a good deal on the conditions of the milk, but it will not take much more than an hour or an hour and twenty minutes.

Mr. Corneilson: I would like to ask what effect salting of the curd in the vat has?

Mr. Zumkehr: I think it will injure the texture of the cheese. You will not get as fine and nice bodied a cheese as when you apply the salt afterwards. It makes a rather coarse cheese.

Mr. Marty: Does salting in the vat have any effect on the curing of the cheese?

Mr. Zumkehr: I do not know that it has. I never practice that at all.

Mr. Marty: I would like to ask the gentleman who put the question if he has had that experience?

Mr. Marty: I have had with gassy milk, and did it to overcome gas.

The President: Any other questions? If not we will take up the next topic.

BRICK CHEESE MAKING.

Harvey Haskins, Madison, Wis.

Instructor in Wisconsin Dairy School, Madison, Wis.

Mr. Chairman, Ladies and Gentlemen:

It is a pleasure to be here and talk with all these cheese makers; to exchange ideas with them and compare notes, so to speak, and with this feeling I come before you now to try and tell you something about brick cheese.

But before I start to talk about the subject assigned me, I

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want to tell you a story. It is told of two Irishmen who were cutting logs on a side hill. After they had sawed off the log, it began to roll, and Paddy, being on the lower side, thought to hold it by jumping in front of it, but couldn't, so the log rolled over him; then Mike said, "Stick to it Paddy—you're on top half the time."

Now my talk may be to the point half the time, but to go back to my topic, I wish to say that the first thing necessary in order to make a first-class brick cheese (as well as any other type of cheese) is good milk.

We must educate the patrons along this line. We must show them how by kindness and not by force. The old saying, "You can lead a horse to water, but you can't make him drink" applies here. You may tell a farmer his faults, but they are not always corrected. A very good way is to show him. The Wisconsin curd test will show him what kind of cheese the milk he is bringing makes. This is the best way I know of to convince a farmer. When you have shown him his faults, help him to locate his trouble. There is a science in caring for milk properly and it is policy always to be kind to the patrons and teach them to be pains-taking people.

Again I say you must have good milk. You would not think of building a bridge out of rotten material and it is just as unwise to expect to make good cheese from poor milk. So insist on the patrons bringing good milk. That brings to my mind the story of a German couple who were living in a quiet town and had met financial troubles which caused the wife to worry considerably, and one day she said, "Ach! I vish I vas in heaven." I don't," said her husband, "I vish I vas in a beer saloon." "Dot's it! Dot's it!" replied the wife, "Dot's chust like you—you alvays vants de best."

Brick cheese factories are now being scattered all over the state and this industry has grown to large proportions since Dodge county started its first factory. I think we need more discussions at our conventions and elsewhere along the brick cheese line. The Wisconsin Dairy School, the Wisconsin State Dairyman's Association, and the Dairy and Food Commissioners are doing all in their power to teach the boys how to make a uniform product of cheese.

It is necessary to have milk with a low acid content for brick cheese. I would say that from .15 to .18 per cent should be the limit for receiving milk, and I see no reason why it is necessary to cause a cheese maker to make cheese twice a day, provided, however, that his patrons are a clean careful people.

Milk should be aerated as quickly as drawn from the cow and cooled as quickly as possible to a temperature of about 50 to 55°, if you have water that cool.

Now after we have milk in our vats such as I have described, we are ready to proceed to the making of the cheese.

First, determine the acidity of your milk, then heat up to a temperature of 88° and add enough rennet to coagulate the vat in about twenty to twenty-five minutes, which will usually require from four to five ounces rennet per thousand pounds of milk. In ordinary cases, if the milk was working good, I wouldn't advise the use of a starter, but in the hot weather when gassy milk is frequently received, I think a starter is all right, as it will enable you to partly overcome the gas germs by the addition of the lactic acid bacteria. The per cent of starter would, of course, be regulated by the way the milk worked and the percentage of acidity of your milk before adding your starter.

When we have our vat set, we scald the moulds and get them placed on the draining table. By this time the curd is ready to cut. We proceed to cut the curd, the same as for American cheese, using the two knives. Having our curds evenly cut, we stir by hand for 10 to 15 minutes then turn on steam and cook up to a temperature of 114 to 120°, depending on the curds, and when we have a sufficient cook, we draw down the whey until there is just enough left in the vat to cover the curd nicely; then we dip in our moulds and allow the curds to drain and settle down; then board followers are placed on the curd in the moulds and pressed by means of two bricks.

At dipping time it is necessary to work very fast so we can get our curds out of the whey and thus prevent an over-development of lactic acid, which would give brick cheese a decided Cheddar cheese flavor, which we do not want.

After the cheese have been in the moulds for a while they are turned over and pressure applied from the other side. when the cheese have pressed sufficiently, we are then ready to transfer them to the salting table and a coat of salt is applied to the outside. This operation is generally repeated once or twice before the cheese are ready for the curing shelves. It takes from two to four weeks before the cheese are ready to be shipped, when they are wrapped in parchment paper with a manilla wrapper. Some factories use a tin-foil wrapper in addition to the paper wrappers.

I don't know that I have told you anything in this talk that you didn't already know, but you have all been very attentive and I hope it wasn't for the same reason that the little boy paid such strict attention in church. When asked by his mother why he took such good notice of the preacher, he said, "I was watching his Adam's apple go up and down."

Mr. Luchsinger: Mr. Chairman, may I make an announcement at this time? I want to announce that we will hold a convention on the 30th and 31st days of January at Monroe, Wis., as the foreign cheese industry predominates there as much as the American cheese, and I wish to invite you all to be with us on those two days at Monroe. As president of the association I tender you all the invitation.

The President: Mr. Fred Marty will be the next speaker on the program and will talk to us about Swiss cheese making.

SWISS CHEESE MAKING.

FRED MARTY, Monroe, Wis.

State Cheese Factory, Dairy & Food Inspector.

Mr. President:

Swiss cheese making is again the subject assigned to me. As this has been the subject assigned to me for the last two or three years it would seem as if I was the only Swiss cheese maker able to take up this subject, now let me tell you that we have many very skillful makers in our section of the state who would be able to thoroughly discuss in detail any particular point in the process of manufacturing Swiss cheese were they to explain themselves in the German language. But with the best efforts of Mr. Baer and myself we have failed to find anybody willing to take up this subject.

This article I have not prepared to describe in detail the process of manufacturing Swiss, but merely to introduce the subject.

It is also my purpose to make some general remarks which I have observed, and causing a great annual loss to our Swiss cheese industry.

However, should any member wish to take up and discuss any particular point in the process of manufacturing Swiss cheese, I would be glad to give my opinion in answer to any question.

In the manufacture of Swiss cheese it is perhaps more so than in any other kind of cheese that only certain condition of the milk will bring about the natural characteristic of a Swiss cheese.

Among the Swiss cheese factories the rule is universally adopted to deliver the milk twice a day which is manufactured into cheese immediately after the milk is received, the hours of delivering the milk are from 6—7 a. m. and 7—8 p. m. each day.

This rule of hauling milk twice a day has become so customary that no second thought is given to the possibility of delivering the milk only once a day. This method was perhaps a good plan in the early days of our cheese industry when the milk producers were unexperienced in handling and caring for milk and the necessity of such for the manufacture of Swiss cheese. The question of delivering the milk only once a day would hardly sound practical to many cheese makers and farmers as they have become so accustomed to deliver the milk twice a day. But I would say right here for an example that any part of the milk delivered once a day to the Monroe Milk Condensing factory could be manufactured into a Swiss cheese equal in quality to that of any average imported Emmenthaler.

Knowledge, experience and better financial condition of our milk producer today would permit them to arrange a suitable milk house and milk cooling system which would enable them to thoroughly care for the milk to be delivered once a day and manufactured into Swiss cheese. Then our hard working cheese maker after a hard day's work and in place of starting another would be blest with a night's rest. The patron in less than half the time required to deliver the milk could cool down the milk sufficiently to let it remain until morning, and the poor old faithful horse in place of making that dreadful hurry up trip to the cheese factory after a day's hard work would be released of the sweaty harness by several hours.

However a suitable milk house and necessary cooling system as delivering the night's and morning's milk in separate cans would in this case be absolutely necessary and should strictly be enforced. Whether he be a small or large parton of the cheese factory.

The Monroe Milk Condensing factory has 125 milk patrons, any of them keep just as many and as few cows as any cheese factory patrons, these patrons comply with the specification called for under contract such as only feeding certain kinds of feed, milk house, milk cooling system and all barns to be whitewashed twice each year. Any milk containing as high as .20 per cent of acidity is promptly rejected. Since our cheese factory patrons claim that they are getting more per pound of milk than the patrons of the condensing factory and besides get back the whey I fail to see why they cannot build similar milk houses and cooling systems and take advantage of hauling milk only once a day.

While it is a known fact that in the fermentation process of a Swiss cheese in developing the required eyes or holes we find that by far the largest per cent of termed "Glaesler" cheese (a cheese where the characteristic nature of developing the eyes or holes in the cheese has turned into long seams) are found among the morning's make, either due to unsufficient lactic acid or ripeness of the morning's milk. While a practical cheese maker wherever conditions were favorable, such as running water, I would set about 300 pounds of the night's milk into the water and hold it over for the next morning's cheese, this method I would practice all season as it would help the fermentation process very much.

It is true that the per cent of lactic acid or ripeness of the milk required in manufacture of Swiss cheese is not known to any maker and it very often occurs that a cheese maker seemingly is getting along very nice with his cheese until to his surprise he learns that he has for some weeks been manufacturing a "Glaesler" cheese of a pasty texture, the body containing seams running throughout the cheese, the flavor being good—somewhat of a sweet taste. This cheese is classed as a No. II and manufactured from a very fine quality of milk.

Let it be understood that this particular kind of cheese is an annual loss to our milk producer of thousands of dollars, since many cheese factories are known to manufacture from one-third to one-half "Glaesler" cheese, or Glaesler with holes, and a so-called blind cheese, the latter however could be traced to improper temperatures in the fermentation process. The Glaesler cheese is mostly consumed by the Italian trade as it seems to answer their peculiar way of preparing it to consume. The cheese dealer often claims to them that it is a special make for their request.

If this particular point was known to the maker that the milk did not contain sufficient lactic acid or ripeness, the manufacture of a "Glaesler" cheese could be avoided to a large extent by working and holding the curd longer before cooking. But as this particular point, knowing just when to apply the steam to the curd, can not be determined by a test other than practical experience, is very often the cause of a "Glaesler" cheese. However, in my opinion, the proper time to avoid a "Glaesler" cheese would be at the time of setting, if the proper ripeness of the milk was known.

For the manufacture of Swiss cheese a home made rennet is used which is made and prepared in two different ways. One most commonly used is prepared out of three-fifths of common whey and two-fifths of water, as a rule about from 2 to 3 quarts in all. Sufficient calf stomach is then added with a little salt so as to give it the required strength. It is then allowed to stand for either 24 or 36 hours. Another home made rennet, which method is practiced by many Swiss cheese makers, is a whey which is heated to 165 degrees F. when a so-called (sour) whey which has gone through this particular process and allowed to stand until a very high per cent of lactic asid has developed, is then added and heated to 180 degrees F. Then another precipitation of the whey will take place. This is the albumen, which is much like the white of an egg and is in solution until precipitated by the so-called "sour" and heat, which is then separated from the so-called precipitated whey and allowed to cool. This whey is then used for the home made rennet and is called a precipitated whey rennet. This rennet when prepared contains a higher per cent of lactic acid and is found to be much purer than the common whey rennet. It also has a good influence on the fermentation process as it produces a more uniform distribution of eyes or holes in cheese, while in the use of a common whey rennet with its ingredients there is a danger of developing abnormal fermentation, and its appliance to the manufacture of cheese very often causes too many and irregular holes also gassy fermentation.

In the precipitated whey rennet again is the danger that during the process of developing the rennet only a lactic acid is developed and is therefore on the same order as a starter, and in many cases where a trifle too much of the liquid is used it destroys the characteristic fermentation of the cheese and turns into a "Glaesler" cheese.

I am, therefore, of the opinion that if the milk patrons of a cheese factory of not more than about 3,500 lbs. of milk a day, could manage to put up a milk house and milk cooling system, then hold their night's milk until morning and deliver it in separate cans for the manufacture of Swiss cheese a commercial rennet extract of uniform strength could be used and the danger of manufacturing a "Glaesler" cheese could be avoided.

The purpose of the common and the precipitated whey rennet is in my opinion only guess work so long as we do not know the required per cent of ripeness of the milk and the amount of rennet to be used accordingly.

An experiment under the authority of the Wisconsin Experiment Station along these lines and under practical conditions in Green County would in my opinion produce valuable information.

DISCUSSION.

The President: Any questions you would like to ask? We will take up the discussion of brick cheese making first.

Mr. Doane: I would like to ask what particular influence the temperature of the curing room has on either brick or Limburger cheese, whether that temperature be high or low?

Mr. Haskins: I think if we are curing American cheese we aim to get the temperature as low as we can and in brick cheese we also want the temperature as low as we can conveniently have it because I believe it produces cheese of better texture, it does not cure out so fast. The lower you can get the temperature and the slower you cure American cheese the better it will be, and I think the same condition applies to Brick cheese. We also get less shrinkage.

The President: Any questions on the making of Swiss cheese?

Gov. Hoard: I want to ask if the process of excessive stirring does not throw off a great deal of excess moisture, because it is throwing off excess fat?

Mr. Marty: I have had an opportunity of experimenting along that line while engaged with the Wisconsin Dairy School in the breaking down of the fine curd particles in the process of making Swiss cheese. I might also add the roughage of handling that particular curd is largely the cause of the large per cent of fat expelled from the casein during the process. Dr. Babcock on this same point claims with a number of milks of different per cents of fat, some are expelled from casein through the misuse of the curd; that may apply to American cheese makers as well as to Swiss cheese makers, by so handling of that particular curd, and furthermore due to temperatures, that there are soluble and insoluble fats in milk, while some fats are not subject to that particular heat, other fats are and as you increase the temperature a certain kind of fat, which I am not able to name, will expel from the casein because of the excess high temperature.

Mr. G. Marty: Is it possible to make good Swiss cheese without this extensive stirring of the curd?

Mr. F. Marty: It is hardly possible for the reason that the fermentation of Swiss cheese is of such delicate nature that the Swiss cheese maker scarcely knows where he is at. In Swiss cheese we must keep the little curd particles separate, entirely separate, not as we often find in American cheese vats, especially when the cheese maker is trying to get a large yield, where you can reach into the vat and pick out a chunk of curd like a bunch of grapes altogether. In Swiss cheese we insist that every little curd particle must be by itself, form by itself, and one of the most essential points that we insist on is having a copper kettle and keeping the curd in continuous motion.

Gov. Hoard: Swiss cheese is more like a skim cheese because a portion of the fat is taken out of it?

Mr. F. Marty: Analysis of Swiss cheese shows that it has on an average 32% butter fat. We take out a good deal but that amount remains.

Gov. Hoard: Then how does that square with the fact of your losing so much butter fat?

Mr. F. Marty: Perhaps we have less moisture, it is a firmer cheese, it is more compact, there is more goods there in the same space. We have less yield in Swiss cheese than in Cheddar cheese and that may account for the per cent of butter fat.

Mr. Doane: That question of fat, I think, has some connection with the question raised in Mr. Marty's paper when he refers to glass. I think Mr. Marty said if the acid was allowed to develop a litte more strongly in settling the curd it might prevent this. Where do you get your authority for this statement, Mr. Marty?

Mr. F. Marty: The reason is this. There is a particular acid (I am not a chemist and cannot tell you the name of the acid) but that acid is the first chemical reaction and forms and develops the holes in Swiss cheese, largely due to the fermentation of the milk sugar. In connection with that it is due to lacic acid. A great deal of the milk manufactured into Swiss cheese either contains insufficient lactic acid to produce that proper fermentation in the cheese, or the cheese makers insist on using home made rennet, not using the commercial rennet extract, so that they neglect to add a certain amount of lactic acid to help along that fermentation.

Gov. Hoard: The holes are due to the expansion of the gas evolved from fermentation?

Mr. F. Marty: I presume I am not answering Professor Doane's question in regard to fat?

Mr. Doane: What I am trying to get at is whether the butter fat in the cheese has any effect on whether the cheese may be glass or anything else.

Mr. Marty: Swiss cheese, we will say, with an excess amount of butter fat or made from milk with a very high per cent of butter fat, would have more of a tendency to develop into glass cheese than that with a lower per cent of butter fat.

Mr. Doane: There is another question in regard to the loss of the butter fat in the whey. It is commonly believed that an excess of butter fat is the cause of glass cheese. It is claimed that you cannot make a perfect Swiss cheese with too high a percentage of fat; I believe Jensen says you can make a perfect Swiss cheese with milk containing as high as 4% fat but he does not believe you can make it with milk containing a much higher per cent. I might say right here that I am conducting experiments in Swiss cheese now. We have made Swiss cheese and lose only three-tenths per cent fat in the whey and we followed out practically all the rules and regulations laid down by expert Swiss cheese makers except that we cut our curd with a curd knife and we got a much more even cut, losing very little fat in the whey, but I am a little bit afraid how those cheese will turn out, we are afraid we are going to get glass cheese.

Mr. F. Marty: I say that a great many experiments carried on should be carried on right out in the field where cheese are manufactured. In our territory we find the highest per cent of glass cheese manufactured is in the month of June and July, when any dairyman knows the per cent of butter fat in milk is the lowest, therefore it cannot be due to the high per cent of fat in the milk. It proves that there is another cause. It proves that it is either due to some insufficient ripeness in the milk, which must be the main factor in the milk to have the influence on the fermentation of those eyes or holes.

Mr. Doane: On the other hand, if you are going to have ripe milk you would have it in July if at any time of the year.

Mr. F. Marty: As I said in my paper, the largest per cent of the glass cheese manufactured is made from the morning's milk. You understand that in our territory milk is delivered very early, not later than seven o'clock under any condition and lots of it is delivered from five to six. During June and July, during the harvest time, a great deal of the milk comes before six before the warm sun has had any influence on the milk.

Member: Do you make cheese twice a day, and what time do you get through in the forenoon?

Mr. F. Marty: About 11 o'clock in the morning. At night it is 11 and 12 and sometimes 1 o'clock in the morning before we are through.

The President: What do you do the rest of the day?

Mr. F. Marty: There is no man busier than a Swiss cheese maker, that is the reason that 99% of the Swiss cheese makers are Swiss. One man is doing two men's work.

Gov. Hoard: When do they sleep, Mr. Marty?

Mr. F. Marty: They sleep from 12 to 5 in the morning. As I said, our cheese is a cheese subject to curing, same as brick and Limburger, and it must be washed, turned and salted every other day. Where they make four a day you can see that a man has as much as a couple of tons of cheese on his hands every day between the two makings.

Member: How much do you pay your cheese makers?

Mr. F. Marty: They are paid by the hundred, a certain amount per hundred.

The President: Why do you make your cheese so large?

Mr. Marty: Well our Swiss cheese makers are quite muscular, to begin with, and they would rather put a little more muscle to one large load than to handle the thing twice. Another reason is that we find the fermentation of a large bodied cheese is more uniform than in a smaller one. For instance, a block cheese sometimes has too much rind and the peculiar characteristic of the Swiss cheese, the development of the eyes cannot go on.

Member: Do I understand he says Swiss cheese in his county is more glass in June and July? I am from Dodge County and have made Swiss cheese for fifteen years, as long as we could make it, but now we cannot make it, and we had our trouble in that respect in September and October.

Mr. F. Marty: During that time perhaps your curing room did not contain the proper temperature to get the cheese started in the fermentation process. The temperature in the curing room is a great factor and it requires skill to cure this cheese. It is something we cannot tell a man how to do, he has to get accustomed to that particular sound he must know when he touches the cheese what it is doing. Some cheese have a tendency to develop faster than cheese made from milk more normal, and such cheese ought to go into a different place. Swiss cheese are at the mercy of the surrounding temperature. If we had three different curing rooms, which all the leading Swiss cheese factories in Europe have, regulated by different temperatures it would be the proper thing; then if one cheese was slower in developing we could have a temperature in one room ten or fifteen degrees higher and put that cheese there; if one was coming faster put in where the temperature was lower and thereby control the fermentation. We have not gone far enough yet so the cheese maker has any control over the fermentation process because the cheese is at the mercy of the temperature.

Member: I believe the finest cheese we have is in May, June and the first week in July, but later on we have trouble.

Mr. F. Marty: I would like to say that some three years ago I brought up this particular point about glass cheese at a convention held here in Milwaukee and I hoped then that some possible means would be brought about on this very particular point, and that some experiments could be carried on under practical field conditions. I do not say the experiment could not be carried out at an experiment station, but there you have not the conditions we have in regard to milk in Green County. Milk delivered ten or fifteen miles is of a different character than that delivered immediately from the cows.

Member: The longest distance I get milk is two and a half miles but I think the trouble is because we make cheese all the year round. We started seven years ago to have the cows coming fresh all the year round, so we have the old strippers and the fresh milk, and they do not make good Swiss cheese at all.

Mr. F. Marty: That is all very true, the stripper milk will not act right with the rennet.

The President: This closes the program this morning, and we will now stand adjourned until two o'clock this afternoon.

FINAL SESSION.

Meeting called to order at 2 o'clock by President Michels.

The President. Mrs. Kempfer is with us again this afternoon and has kindly consented to favor us with another solo.

Solo by Mrs. Kempfer.

The President: The first subject this afternoon is the Feeding Value of Alfalfa by Professor Otis, of the Agricultural College at Madison.

THE FEEDING VALUE OF ALFALFA.

PROFESSOR D. H. OTIS, Madison, Wis.

Animal Nutrition, Agricultural Experiment Station.

I assume that every cheese maker in Wisconsin is interested in the dairy cow and the man who is handling the cow, and that he is willing to study anything that will promote an increase in the production of dairy products. It should be his special delight to consult with the patrons of his factory as to the best methods of handling their crops and dairy cows in order to produce the largest net profit.

There are three important factors to successful dairying, first, the man; second the cow, and third, the feed. I wish to consider in this article only one phase of the last factor, viz, the profit secured from the feeding of alfalfa and the combinations of other feeds to use with it in order to produce the largest returns from the minimum expenditure for feeds and labor.

There are many things concerning the nutrition of farm animals that we don't know but there are some points that are well established. A study of our experiment station reports and bulletins show that an average cow, giving about 25 pounds of 4 per cent milk daily, requires digestible nutrients per day of 1.8 pounds protein, 12 pounds cardohydrates and .5 of ether extract (fat). There is little difficulty to provide for the carbohydrates and other extract form the common feeds grown on the farm but when it comes to furnishing the protein, we find the problem a more difficult and usually a more expensive proposition. The large demand for oil meal, cotton seed meal, and gluten meal is because of their large percentage of digestible protein. Usually these feeds are expensive and if we can find a substitute for them, we will materially advance the dairy interests of this State.

Probably no one here has failed to hear of the merits of alfalfa for feeding purposes and yet I will venture to say that there are a large number who do not fully appreciate its value.

ALFALFA AS A FEED FOR DAIRY COWS.

Alfalfa and bran compared as to digestible nutrients.—The value of alfalfa from a chemical standpoint is shown in the following table:—

Name	Digestible nutrients per 100 lbs.		
	Protein.	Carbohydrates.	Ether extract.
Alfalfa................	11.0	39.6	1.2
Wheat bran..........	12 2	39.2	2.7

This table shows that every 100 pounds of alfalfa contains 11 pounds of digestible protein and that wheat bran, which has for a long time been held in high regard as a feed for dairy cows, contains only 12.2 pounds of digestible protein. If an average sample of alfalfa contains 11 per cent of digestible protein, a good quality of alfalfa hay will contain practically as much digestible protein as bran. Records obtained at our experiment station and from farmers over the State indicate that we can produce at least four tons of alfalfa per acre. If our dairy farmers could produce four tons of bran to the acre, they would think that they were doing well but here is a chance to produce four tons of the equivalent of bran.

Alfalfa and linseed meal compared.—Linseed meal at the present time is worth about $35.00 per ton. A ton of oil meal contains 586 pounds of digestible protein and as we buy oil meal almost solely for that ingredient, we might value it upon its protein content alone which would make the protein worth six cents per pound. A ton of alfalfa contains 220 pounds of digestible protein, which at six cents per pound would be worth $13.20 and if we get four tons to the acre, we would have a value of $52.80. Of course, for a dairyman to realize this much from an acre of alfalfa, he must feed judiciously and in proper combination with other feeds but if he realizes only one-half of this amount, he is getting excelent returns from his land. As Wisconsin farm land increases in value, it becomes more and more important that we increase the value of our crops per acre and the growing of alfalfa is one of the best steps in that direction.

Is the protein in alfalfa equivalent to the protein in grain?—At the New Jersey Experiment Station one lot of cows was fed a daily ration of 35 pounds of corn silage 11 pounds of alfalfa hay, 6 pounds of mixed hay and 2 pounds of cotton seed meal. Another lot of cows was fed in comparison on the same amount of silage and mixed hay and received 4 pounds of wheat bran and 4 pounds of dried brewers' grains in place of the alfalfa hay. The cost of feeds per ton for these experiments were wheat bran and dried brewers' grains $17.00, and cotton seed meal $26.00. The roughage was placed at the cost of production. $2.50 per ton for silage, $5.34 for mixed hay and $6.38 for alfalfa hay. The results show that there was a saving of 12 7 cents per hundred in the cost of producing milk and 2.3 cents per pound in the cost of producing butter when the alfalfa ration was fed. On this basis, the New Jersey station estimated that when bran and dried brewers' grains can be purchased for $17.00 per ton, that the alfalfa is worth as a substitute $11.16 per ton. They figure that the average production of their land for three years at this rate amounted to $51.00 per acre and in one other year to $74.21 per acre. They judged from this experiment that the protein in alfalfa could be successfully and profitably substituted for the protein contained in wheat bran and dried brewers' grains.

A second experiment at the New Jersey station compared alfalfa hay and corn silage with corn stover, corn silage and a grain mixture of distillers' grains, wheat bran and cotton seed meal. The analyses of the two rations showed that they were practically equal in both protein and total nutrients. The results at the end of one hundred and twenty days showed that although the purchased feed ration produced 20.6 per cent more milk, it was figured that the value of alfalfa hay in replacing a feed mixture of wheat bran, distillers' grains and cotton seed meal was worth $14.50 per ton. This experiment indicates that a pound of protein in alfalfa is not equal to a pound of protein in the grains used but as the alfalfa can furnish the protein much cheaper than the grains and while it may not be desirable to make an entire substitution of alfalfa for grain, it can to a large extent replace the grain.

At the Maryland Experiment Station fifteen cows were divided into two lots of seven and eight respectively. One lot was fed a ration of alfalfa and corn meal. The other lot was fed corn silage and a grain mixture of malt sprouts three parts by weight, linseed meal one part, gluten meal one part, and corn chop one part. These lots were fed for a period of twenty-eight days when the rations were shifted. The lot that changed from alfalfa and corn meal to silage and mixed grains produced 197.4 pounds less milk the second period than the first. The lot that changed from silage and mixed grain to alfalfa and corn meal gained 78.8 pounds of milk during the second period over the first. The total amount produced by both lots on alfalfa and corn meal was 7,248 3 pounds. The total amount of milk produced on silage and mixed grain was 6,972.1 pounds. This makes a difference in favor of the alfalfa and corn meal of 276.2 pounds of milk. It should be noted that where a small amount of grain is fed with the alfalfa that the total results are favorable to the alfalfa ration even though the other ration contained a greater variety of rich and appetizing grains.

The Maryland Station made an additional experiment in comparing a ration of alfalfa and silage without grain with a ration of silage and grain. The results show that the cows gave less milk when receiving the alfalfa and silage than those receiving the silage and grain. Although the ration of alfalfa and silage figured up well as far as digestible nutrients were concerned. it did not result in as large yields and indicates the desirability of feeding some grain, even though the cows are receiving roughage that is rich in digestible nutrients. This experiment corresponds closely with the second experiment reported from New Jersey.

Alfalfa compared with prairie hay.—At the Nebraska Station twelve cows were divided into two lots of six each. At the beginning of the experiment each lot was producing practically the same amount of milk and butter. Lot 1 was fed for six weeks alfalfa hay, beets, and a small grain ration composed of equal parts of bran and corn. Lot II was fed for the same length of time on the same feed except that prairie hay was substituted for the alalfa hay. At the end of six weeks, the feed of each lot was changed, Lot 1 receiving the prairie hay and Lot 2 the alfalfa hay. At the end of twelve weeks the results were sumarized as follows:

	Milk.	**Butter.**
	Lbs.	**Lbs.**
The cows while receiving alfalfa produced..	**9,862.74**	**511.47**
The cows while receiving prairie hay produced....................................	**9,722.49**	**502.07**
The cows while receiving alfalfa hay produced....................................	**140.25**	**9.40**

In commenting on these results the Nebraska Station shows that the lots changed from prairie hay to alfalfa in the beginning of the second six weeks were at a disadvantage as their milk flow had been reduced the first six weeks and the claim is therefore made that the alfalfa gave even better results than indicated in the above figures.

Alfalfa as a factor in economical production.—In a more recent bulletin from Nebraska detailing the results with their dairy herd for ten years, record is given of the food cost of producing butter fat where alfalfa and silage constituted the roughage. These varied from 6 to 12 cents in 1905, the average for the year being 9.2 cents. The next year, 1906, the cost varied from 6 to 16 cents, the average being 9.4 cents. The profit per cow in 1905 (value of butter fat less cost of feed) was $11.93. In 1906 the profit increased to 43.54. These good results are in a large measure due to alfalfa.

The value of alfalfa meal.—The Pennsylvania Station divided ten cows into two lots. Both lots were fed daily, corn silage 30 pounds, mixed hay 12 pounds, corn meal 3 pounds, and cotton seed meal 1 pound. Lot 1 received during the first period of three weeks 4 pounds of wheat bran per cow, while lot 2 at the same time received 4 pounds of alfalfa meal as a substitute for the wheat bran. The experiment lasted for four periods of three weeks each, and at the end of each period the wheat bran and alfalfa meal were shifted. The cows while receiving the alfalfa meal fell off in milk production in both cases more rapidly than those receiving the wheat bran. In commenting upon the results, the Pennsylvania Station says that there is no reason for believing that the alfalfa meal is any more digestible than the hay from which it is made and they claim that it may be less digesible on account of the temptation to use poor grades of alfalfa in grinding the meal. For this experiment the alfalfa meal cost $23.00 per ton while the wheat bran was purchased at $20.00 per ton. At this price alfalfa can not be recommended for the most economical milk production. Assuming that the alfalfa meal cost no more than bran ($20.00 per ton) the experiment shows that the alfalfa meal would have produced milk at a lower grain cost per one hundred pounds, viz, 44 cents as compared with 45.3 cents for bran. On this basis the station figured that if wheat bran was worth $20.00 per ton, alfalfa meal was worth $21.28. While this experiment does not prove the desirability of using alfalfa meal as a dairy feed, it does show emphatically the value of the alfalfa plant and coincides closely with the results at other stations where alfalfa was found practically equal to bran pound per pound.

Alfalfa hay compared with cotton seed hulls, mixed hay, and mixed hay with silage.—The Texas Experiment Station tested the relative value of these roughage feeds with four lots of cows receiving the same kind of grain. The prices of the feeds were alfalfa $16.00 per ton, cotton seed hulls $6.00 per ton, mixed hay $10.00 per ton and silage $4.00 per ton. The experiment lasted for twenty-eight days at which time the alfalfa hay lot showed a profit over the cost of feed of $10.18 per cow; the cotton seed hulls $8.50, the mixed hay $9.37 and the mixed hay and silage, $9.05 per cow. These results again show the superior value of alfalfa compared with other roughage feeds.

Alfalfa compared with mixed hay, with varying amounts of grain.—The Utah Station divided ten cows into two lots, one lot receiving alfalfa hay and the other mixed hay. The grains in each case were a mixture of wheat and bran, equal parts by weight. The experiment lasted for seven periods of three weeks each. The amount of grain fed each lot varied from six to twelve pounds, all changes being made at the beginning of the period. The results indicate that any increase in the grain ration over six pounds per day increased the cost of dairy products, almost without exception with both kinds of roughage. The amount of roughage consumed was practically the same for both lots. The five cows receiving the mixed hay ate 56 pounds more grain during the 147 days under experimentation. Considered from an economical standpoint, the alfalfa proved the superior roughage.

A second experiment of a similar character was conducted at Utah with approximately the same results.

The value of alfalfa for wintering cows without grain.—The Kansas Experiment Station tested the value of alfalfa for wintering cows not in milk. Seven head composed of dairy and beef animals were placed in the feed lot in September and received nothing during the winter except alfalfa hay. The results are recorded in the following table:

Results in wintering cows entirely on alfalfa hay.

No. of cow.	Breed of cow.	Age.		Weight Sept. 2, 1901.	Weight April 4, 1902.	Total gain 213 days.	Daily gain.
		Yrs.	Mos.				
				Lbs.	Lbs.	Lbs.	Lbs.
1.....	Shorthorn.......	2	7	1,000	1,330	330	1.54
1.....	Hereford........	1	10	840	1,111	271	1.27
3.....	Holstein........	2	6	980	1,268	288	1.35
4.....	Holstein........	2	6	950	1,238	288	1.35
5.....	Red Polled......	1	5	450	701	251	1.18
6.....	Galloway........	1	10	651	810	159	1.06
7.....	Galloway........	1	10	829	1,039	210	1.40

It was noted that the cows greatly improved in their appearance while being fed alfalfa.

Alfalfa as a soiling crop.—The Kansas Experiment Station fed green alfalfa to a herd of ten cows for 74 days. Figuring the butter fat at creamery prices and deducting the cost of grain, the green alfalfa brought an income of $1.95 per ton or $25.26 per acre. Other crops were also fed as soiling crops in comparison with alfalfa but none were as well relished or brought as large returns as shown by the fact that corn brought $22.79 sorghum $15.60, Kafir-corn $13.83 and otas $6.81.

Alfalfa as a silage crop.—The Kansas Experiment Station reports an experiment of putting the first cutting of alfalfa into the silo. On account of continuous rains, the alfalfa had been allowed to stand too long and consequently was rather coarse and badly rusted and contained a considerable quantity of horse weeds. *(Leptilon Canadense)*. This alfalfa would have made exceedingly poor hay. When the silo was opened, it was found that the top two feet were moulded badly but below that it was in excellent condition. The mouldy silage was hauled into the pasture where it was noticed that the cows ate it readily. When fed in the stable, it was noticed that two-thirds of the cows ate the silage, weeds and all and the other third ate all but the weeds and it was possible to keep up the flow of milk in July when the pasture was dry and scanty by the use of this alfalfa silage.

ALFALFA AS A FEED FOR HOGS.

Experiments in feeding alfalfa to hogs are not as yet numerous but some interesting facts have been brought out from the few experiments that have been conducted.

Alfalfa hay for hogs.—The Colorado Experiment Station fed alfalfa to hogs as roughage and the results show that the pigs ate more grain and made larger gains than on a similar ration without alfalfa.

At Utah, alfalfa is reported as giving favorable returns in connection with a limited grain ration.

The Kansas Experiment Station divided twenty hogs into two lots as nearly equal as possible. One lot was fed Kafir-corn meal dry alone. The other lot was fed Kafir-corn meal with alfalfa hay. The results per bushel of grain are as follows:—

Kafir-corn meal dry and 17.83 pounds of alfalfa hay produced 10.88 pounds of gain.

Kafir corn meal dry alone produced 7.48 pounds of gain.

This shows a rate gain of 868 pounds of pork per ton of alfalfa fed. A second experiment showed that alfalfa hay which was poor in quality increased the gains at the rate of 333 pounds per ton fed. An experiment at the same station in grinding alfalfa hay for hogs resulted in a loss. A later experiment at the

Kansas Station showed that 102 pounds of alfalfa hay took the place of 64 pounds of grain. The extra gains due to alfalfa show the latter to produce at the rate of 235 pounds of pork per ton.

In connection with the results obtained in feeding alfalfa hay to hogs at the experiment station it is interesting to record the experience of Ex-Governor Hoard in successfully feeding his brood sows prior to farrowing on nothing but alfalfa with an occasional small allowance of skim milk.

Alfalfa as a hog pasture.—The Utah Station reports that alfalfa without other feeds, either pastured or cut and fed green, would barely maintain pigs but when grain was fed in addition. the rate of gain was nearly proportionate to the quantity of grain fed.

At the Kansas Station 36 pigs were divided into three lots. one receiving no pasture, another alfalfa pasture and the third rape pasture. Each lot was divided into two sections, one receiving skim milk, and the other butter milk. The mixture was the same for all pigs. viz., shorts one half, corn one fourth, and Kafir-corn one fourth. The results were as follows:—

Grain consumed per 100 pounds of gain.

	Skim milk.	Buttermilk.
	Lbs.	Lbs.
No pasture	333	379
Alfalfa pasture	297	313
Rape pasture	304	301

The gains of the hogs in the different lots were nearly equal but the amount of grain consumed per one hundred pounds of gain as indicated by the above figures is considerable less with the hogs on pasture. It will also be noted that there was little difference between the gains and grain consumed per one hundred pounds of gain between the alfalfa and rape pasture. The area required in furnishing this pasture was only one half as much with alfalfa as with rape.

Alfalfa has also produced excellent results in feeding steers. brood mares, growing colts, and some have even had good results in feeding alfalfa hay to work horses. Poultrymen are advocating alfalfa for the production of eggs. A review of the results of feeding alfalfa with the various classes of animals shows it to be by far the best known roughage for farm animals. Red clover has been rightly held in high esteem but according to its composition and the results obtained in feeding farm animals, it has been found that two tons of alfalfa hay is practically equal to three tons of red clover. When we think of alfalfa as a perennial plant, that it produces a larger yield than any other hay crop, that it extends its roots into the lower soil and brings up plant food from the sub-soil, that its roots are covered with tubercles, the home of micro organisms that have the power to lay hold of the nitrogen in our atmosphere and convert it into plant food, thus leaving the soil richer than it was before the alfalfa was grown, we cannot help but think that alfalfa is a wonder plant. There seems to be little or no question as to its adaptability to Wisconsin conditions and as the feeding trials almost invariably show its superior results, it behooves us to urge our farmers cautiously but earnestly to grow this crop as soon as possible in order to get the largest net returns from their land.

DISCUSSION.

The President: We have had a very good address on this subject and I presume there are some questions you would like to ask the professor in regard to this matter and if you have any questions to ask I would like to have you bring them up as rapidly as possible and right to the point.

Mr. Dassow: Is the hay fed to hogs cut or fed whole?

Prof. Otis: Fed whole.

Mr. Dassow: Will they pick it all up clean?

Prof. Otis: Reasonably clean, yes, but they were charged up with it in this instance.

Member: Where do you find the alfalfa seed and how much does it cost per pound?

Prof. Otis: That is something for you to take up with your seed man or if you will write to Prof. Moore, of the Agricultural College, I think he can refer you to a number of our short course students over the state who are raising alfalfa. He undertakes to order a considerable quantity of alfalfa seed for those who are interested. Alfalfa seed commands a pretty good price but when you consider that you only need about 20 lbs. to the acre it is not so very expensive.

The President: The next on the program was to have been an address by Honorable E. H. Webster of Washington, D. C., but as Mr. Webster is not here we have with us Professor Doane as his representative, and I will call on Professor Doane at this time.

ADDRESS.

PROFESSOR C. A. DOANE, Washington, D. C.

Dairy Expert, U. S. Dept. of Agriculture.

Mr. Chairman, Ladies and Gentlemen:

Mr. Webster asked me to express his very deep regret that he has never yet been able to attend a convention of the Wisconsin Cheese Makers. I think he feels that he necessarily had to slight this convention; it has been his desire for two or three years to come and he expected to be here this year but something came up which brought him to Canada.

The few words I am going to say today is along the business side of cheese factory management. The dairy school has been established largely to turn out good cheese makers. I think everything that has been said here has been in regard to the necessity for making good cheese. That is all right in its place but there is another side to that. A man has to be a good business man in a creamery or cheese factory if he is to make a success of the work. I have had my attention brought to that fact particularly in the last couple of years as the dairy division does considerable work in a factory north of Plymouth. The man we happen to be in with there always manages to pay his farmers just a little above, sell a little bit better than any of the factories around there and at the same time is making an exceptionally good living for himself. The result is that some farmers are leaving other factories and coming to his. It is natural and in the keen competition which cheese makers experience in the cheese districts, it is the best business man, the man that pays his farmers the most for their milk, that will come out ahead.

I was interested in Mr. Benkendorf's talk regarding the moisture test for cheese. You know in the butter making world this is quite an important item. There is much going on right along about the moisture in butter, its control and effect on butter so they can get that down to a pretty fine point, and the best man is the man who rubs just as close to the 16% standard as he can or dares to, and does not get caught by the revenue officers. That is a pretty strong way to put it, but it is a fact nevertheless. There are a good many things to be known about moisture in cheese and the time is coming when the moisture test which Mr. Benkendorf talked about, or some other simple test, is going to play an important part in the business management of cheese factories. We have to know, of course, several things before that, the effect of too much moisture on cheese, etc. I suppose a good many people will be trying to figure out how they can get the most moisture in cheese and not affect the cheese so as to affect the price.

The casein test illustrated by Mr. Hart, in connection with the Babcock test, the moisture test and experiments to be conducted with those things I hope in the not far distant future, are going to open up a problem which will put the cheese makers who want to learn in a position to be a little ahead of any competition they have in their districts.

The President: The next subject to be discussed is the National Dairy Show and its relation to the cheese makers. This subject was to be taken up by Mr. E. Sudendorf, of Chicago, Secretary National Dairy Show Association, but Mr. Sudendorf was called away and Mr. A. J. Glover, of Fort Atkinson, has consented to say a few words in his place.

THE NATIONAL DAIRY SHOW AND ITS RELATION TO THE CHEESE MAKERS OF WISCONSIN.

A. J. GLOVER, Fort Atkinson, Wis.

Editorial Staff, Hoard's Dairyman.

Mr. Chairman, Ladies and Gentlemen, Members of the Wis. Cheese Makers' Association:

I promised Mr. Sudendorf that I would try to set before this organization the objects of the National Dairy Show. You are all aware, perhaps, that we have held two successful national dairy shows in the city of Chicago. We have brought together at those meetings all the different appliances for the manufacture of butter and cheese, for the bottling of milk and delivering of it to the consumers of the city. Lack of funds has prevented us from appointing a cheese superintendent and therefore we have not had the cheese makers with us to any great extent. This was not because we did not want them or because we had forgotten them, but it was due largely to the fact that we lacked funds that we have not extended to you a hearty invitation and offered you a premium in order that you might exhibit your cheese.

A show of this kind is a large undertaking; it cost us in the neighborhood of thirty thousand dollars to hold this last show and that amount was made up by the men that made the exhibits and by admission to the show, and I believe that everyone that attended it feels that the National Dairy Show has been a success. It brings together all the different interests in dairying. It offers a place for the exchanging of ideas among butter makers and cheese makers, dairymen and breeders of cattle of dairy type. We had at the last show the largest exhibit of dairy cattle that was ever brought together on this continent. There was represented the Ayershire, the Holstein, the Jersey, the Brown Swiss, the Guernsey and the Dutch Belted. There was an opportunity for the farmers to study the characteristics of each of these breeds to see what the breeders' skill had developed in our country and in other countries, for we had four herds from Canada.

Now this organization we represent has been brought about to improve the dairy industry of the country, to add strength to it, to make it appear before the American people that dairying is of some importance. The International Stock Show has been of great benefit to the beef interests; it has made the beef interests well known, not only in this country but in foreign countries, and here are the great dairy interests of the United States that have been little known and little appreciated by the people of this country, with the exception of those directly interested in the industry. Very few indeed realize that the dairy industry is anywhere nearly as important as the beef industry, yet it is larger and is of more importance to the people of this country. Therefore we have organized this National Dairy Show, by which we can bring together all the different breeds for the purpose of educating ourselves in the subject of dairying, and at the same time let the people know what we are doing.

Now my object this afternoon in appearing before you is to urge and invite you, if you please, to co-operate with us in making the National Dairy Show larger and better than ever before. It is not organized for profit. I have given my time, Mr. Sudendorf and others have really given their time with no compensation; we have given money and we have lost this last year between three and four thousand dollars; but that did not stagger the stockholders who are interested, sixty-five men holding the shares. I believe the next National Dairy Show will be able to pay good premiums to the cheese maker, to the butter maker and to the cattle exhibitors; we will offer you a place for holding your meetings, offer a place to the butter makers and also to the dairymen, and our show will in no way conflict with your society, will in no way attempt to absorb or control it. The only thing we would like is to have you meet at the same time we hold our show, holding your convention in the same way as you are doing now. You could hold it in this hall but we would have the show in the new auditorium and perhaps there would be room in there for you. The only difference would be, you would hold your meeting at the time of the show and each of you would be asked to encourage your patrons to come and see the different breeds of cattle, have opportunity to exchange ideas with the best men from all over the United States. We can be a sort of national organization and by bringing together all those different societies we would have greater strength than we have acting singly, and that in brief is the object and purpose of the National Dairy Show. I thank you.

The President: Any questions you would like to ask Mr. Glover at this time in regard to the National Dairy Show? If not we will pass on to the subject next on the program, and listen to a talk by Mr. Shilling, President of the National Dairy Union and Associate Editor of Chicago Dairy Produce.

WORK OF THE NATIONAL DAIRY UNION.

S. B. SHILLING, Chicago, Ill.

President National Dairy Union, Secretary National Butter-Makers' Association.

Mr. Chairman, Ladies and Gentlemen:

I assure you I am not going to stand before you for more than a few moments. It is not my first appearance, I was up there last night and I am not going to take much more of your time.

First I want to congratulate you and tell you I think I have attended the best meeting of the kind that I have ever attended in my life. I am not going to undertake to tell you any thing about cheese making because if I did you would find out pretty quick what I did not know would fill a mighty big book.

I have noticed while sitting here and listening to the papers and discussions that you are up against pretty near the same problems the butter makers are out in Iowa, my state. Your chairman introduced me as from Chicago but I live in Iowa, although I stay in Chicago. It seems to me you are up against the same propositions only not quite so bad; for instance, you have not to contend with the centralizing plants in this state the way the boys have over there, and for years they have argued the same questions about quality that you are discussing here today. Every man who spoke said that you must have a fine quality of milk to make a good cheese. We have been up against the same proposition and have told the boys they should reject all poor milk but we have quit that. That may seem strange to you over here but we do not do it there any more. We tell them to take it, we have to take it. That may seem a strange condition to you but if you were threatened over here with the invasion of your territory by centralizing plants that dropped in here and there and took a man, you would have to act upon the same advice that we are giving the boys there now, take it. You have to take it, you cannot help it, but at the same time we say "Do your very best with your personal efforts and influence to get the quality better." That is all we can do over there. I believe you can still resort to drastic measures here and I think you ought to continue that as long as you can, but if the time comes when you are threatened with the invasion or a foreign enemy, threatened with destruction of your factory. I would say "Take it and do the best you can with it," but use your own personal influence to get the quality improved, work with your patrons. I heard one man say during this convention, and I was glad to hear him say it, that during thirteen years' experience in a cheese factory, he never insulted a patron. That was a nice thing to say if I were going to give you boys a word of advice, it would be to work along the line of improvement with your patrons, to improve the quality of your milk.

I am going to say a few words to you about the National Dairy Union first. I know you gentlemen in the cheese making industry are interested in the organization; you are interested in a financial way if for no other reason, because you must realize the more milk that is made into the butter product, the greater sale of that product, the more sale there is of your product. Yau are interested as much as the man that is making butter today. We have had during the last year butter at the highest price it has been for years, 27.79 cts. per pound on the average in New York during the past year. That is higher than it has ever been in the history of butter. Ten years ago the average price was 16½ cts. for the year and from that time on it has been gradually going up, until last year we averaged nearly 28 cts.

I have made this statement before audiences before, and at one time was laughed at for it, but the longer I live the nearer it comes to bearing out the prophecy I made, that you can turn every foot of available land in this country into the production of butter and if you only make the product fine enough you will never overdo the business. I wish you would remember that; I have said that for ten years and I believe the history of the butter production in this country bears me out in that statement, and I believe the same thing is true with the cheese industry,—I believe if you can make your product fine enough you may put every available foot of land in this country into the production of cheese and you will not overdo it. I do not think you will ever again see a low price for butter or cheese. I speak more confidently of butter because I know more about it, but I want to say that you will never again in the history of this country see a time when butter will be at a low price.

The last time I stood before you I said that I did not think there would be a time for some years to come when the dairy interests would not be threatened by oleomargarine, that I did not believe it was possible for the National Dairy Union to dissolve their organization and leave the fraud open, and the longer we study the situation the more convinced are we that such is the fact. The high price of butter the past year has been used as an excuse for the oleomargarine people to go to the consumers and tell them the high price of dairy goods was because of the oleomargarine law and if they will join with them and secure the repeal of that law that they will see butter down again. It is an argument that is having more influence and effect than any argument they have ever been able to use against us. The high price of butter has made it prohibitive for the average wage earner to consume, he cannot afford to consume butter at 32 to 40 cts. a pound. The oleomargarine people have taken advantage of that fact, but here is the thing that is going to save us now, if there is anything on earth to save us. Already there have been two or three organizations formed, particularly at St. Louis, to go to Congress and endeavor to secure a repeal of the law. What this move will amount to we do not know but we do not think they can do anything. We have assurances from the same men who steered us clear of the breakers when we secured this law that it is impossible for the oleomargarine people to do anything this year, for this reason,—we know we are on the verge of an election and no party is going to take the chance of jeopardizing its interests by taking on a bill that is going to be antagonistic to a large number of the people, and on that one fact at this time we are building our hopes that nothing will be undertaken during the present session of congress. You know as much about that as I do. We have the assurances of the loyal men in Congress that this will be the status of affairs. If anything is undertaken we do not look for it until the end of the session anyway.

Now I want to say to the Members of the Wisconsin Cheese Makers' Association, do not forget the National Dairy Union. Remember it is an organization guarding your interests, not directly perhaps but indirectly.

While I am before you I want to say a few words more about another organization and that is the National Butter Makers' Association. I am sorry we could not unite the two interests and have a great national convention to come together at least once a year. We will have a large convention that will meet in St. Paul in March and it is our intention to try and make that convention one of the largest that has ever been held. We have the grandest building there, erected for that purpose and probably that ever will be, unless perhaps the new auditorium in this city.

We are going to hold that convention in March and I am going to take it on myself to invite as many of you as possible to come. There will certainly be something there that will be of interest and instruction to you and I know I am voicing the sentiment of the butter makers of the United States when I say I wish you could meet with us in St. Paul in March.

Mr. Glover: I had the pleasure this afternoon of being at two meetings with Mr. Shilling and his remarks at these two different meetings has suggested to me this pun—"If the devil was sick, the devil a monk would be, but if the devil was well a devil of a monk was he." At the first meeting this afternoon Mr. Shilling said he was from Chicago, at this meeting he said he was from Iowa. I would like to know where Mr. Shilling comes from and where he belongs.

Mr. Shilling: I did not expect Mr. Glover would come over and tell that but it was put up to me so hard at the other meeting that I had to say something. I stay in Chicago, didn't I acknowledge that, but live in Iowa. I do not think I made any misstatements because I am willing to stand before you and say again I stay in Chicago, and already I have told you that I live in Iowa.

Mr. J. G. Moore: I believe, under the legal definition, where a man lives is where he sleeps and has his washing done. I would like to know whether Mr. Shilling has his washing done in Iowa or in Chicago?

Mr. Shilling: Now, Mr. Chairman they are twitting me because I am an old bachelor.

The President: What do you wish to do with the topic Silos and Silage?

Mr. J. G. Moore: Mr. Hill is unavoidably not here. I would suggest that Mr. Glover is conversant with the subject and undoubtedly would be kind enough to tell us something about ensilage and its effect on milk.

The President: Mr. Glover we would like to hear from you.

SILOS AND SILAGE.

A. J. GLOVER, Fort Atkinson, Wis.

Mr. Chairman and Gentlemen:

I presume there is not a man in the audience that does not know something about the merits of silage. I think as we go more and more into the subject of caring for and feeding dairy cows the more imperative is the need of a silo.

There is no reason why the cheese makers of Wisconsin should not make cheese twelve months in the year. There has been, and I presume there always will be in the early part of the spring when cows are being fed on dry corn stalks and fodder which does not keep them in the best of condition, more or less trouble with the milk in manufacturing cheese. We speak of the fodder cheese, it is apt to be more or less dry, the milk is hard to convert into a good cheese. I do not think it is the season of the year that has anything to do with this, perhaps the period of lactation does, but I do think at the bottom of it all is this, that the farmer does not properly feed his cows. A cow on a hay stack or straw stack, fed dry fodder with very little if any grain, does not produce a milk that will make a good cheese, but with the use of a silo all that can be overcome and the cow would be in as good condition for producing milk in the middle of January as in the middle of June. For instance, we will refer to the herd on Hoard's Dairy farm. Our cows are as sleek today, their coats are as smooth and they are giving as much milk as they did in June, and I believe that milk will make as good cheese today as it would make in June because those cows are properly nourished. Those cows are in good, first class condition and they are kept that way by the use of the proper kind of food. They have silage, which is a succulent food, it tends to keep their bowels in good condition; in other words, it has a certain effect upon the animal's digestion that dry fodder does not have. In connection with this they were fed alfalfa and a little grain, but the basis, Members of the Cheese Makers' Association, of our ration is farm silage and alfalfa hay.

In my early days I was a cheese maker. I know what it is to lean over three or four vats in a factory and turn out a cheese a day. I know what some of you men have to contend with early in the spring and in midsummer when the farmers do not take the right kind of care of their milk. I believe if the farmers would build a silo and feed the dairy cows as they ought to be fed there would be no reason for laying off three or four months in the winter because you did not get the proper kind of milk or no milk. Your factories would have to be made somewhat different, your curing rooms would have to be somewhat different.

I would ask you then to urge upon your patrons the importance of building a silo. You may ask what kind of a silo. There are a great many good kinds of silos and the kind to build depends a great deal on the locality in which you are living. If you have plenty of gravel at the farmers' command I would have you encourage them to build a cement silo, if you have the stone build a stone silo, if you have not that build a stave silo. A stave silo is good silo. It does not last forever but it is a good silo.

The first thing you should bring before your patrons in the construction of a silo is to be sure and have them build a silo in accordance with the size of their herds. If a man has twenty cows he does not want to build a silo large enough for the feeding of forty cows: he wants to be sure and build a silo so that a certain amount of silage may be fed each day. You should always bear in mind this point,—that silage is nothing more or less than canned corn and there is just simply the difference between canned corn and corn fodder as there is between canned peaches and dried peaches. One of the mistakes the early builders of silos made was to build their silos too large in diameter and they could not feed off enough of the silage so it spoiled, just as your fruit will spoil if you open more cans than you can consume in several days. One rule I have given is to build a silo twice as high as its diameter: if 16 feet in diameter, build it 32 or 35 ft. high; if you build a silo 20 ft. in diameter, and that would be the limit, build it 40 or 45 ft. high and let it extend into the ground four to six feet. That, however, is not as necessary as it was when we had the carriers to put up. If any of you had experience in that you know what a job it was, but with a blower it is easy to fill a 60 ft. silo.

A silo 16 ft. in diameter and 35 ft. high will carry twenty-five to thirty cows, I think, (I am not just sure of this) for 250 days, so you can figure the capacity of a silo for yourself. Remember a cubic foot of silage weighs 45 lbs.; a cow consumes 35 to 40 lbs. of silage a day; if this man wants to feed 200 days, you can figure how large a silo he wants by the number of cows he has. Encourage him to build one large enough to have a summer silo. You know in August the milk is apt to fall short and if your patron has a silo so as to have succulent silage while the pasture is dry you are apt to find great difference in your milk receipts. I sometimes think the dairy herds of Wisconsin like silage twice as much in August, in the dry period, as they do in the middle of winter. If your herd drops down it is very hard to bring them back to their normal flow again.

Moreover, the silo makes the farmer more independent of high priced feeds. With a good silo, which will furnish succulent food, and with plenty of alfalfa hay the farmer is very, very independent indeed of the high priced feed, and we all know at the present time that is a very important point. We are asked many questions in regard to rations for the dairy cow at this time, some people writing us that their rations are exceeding twenty to twenty-five cents per cow per day. If a farmer provides himself with ensilage and alfalfa he has one of the best rations that it is possible to produce and I am sure if you makers can induce your patrons to feed their cows that way your factories will run the year round, that you will of necessity increase your milk supply, that it will mean better milk to you, mean constant employment, it would mean the making of better dairymen out of the farmers that come to your factories.

You boys do not realize, at least I did not realize when I was a cheese maker and a butter maker how much I could do for the patrons that came to my factory; I did not realize that I could supply them with good dairy literature. I talked to them in my limited way about this, that and the other thing, but I did not reach out far enough and put into their hands bulletins from our experiment stations, agricultural papers, etc. I was not on the lookout to pick out the different papers that came to me and put them into their hands. You can be of great service in helping your patrons to make better dairymen of themselves if you will only grasp the opportunity. I thank you.

DISCUSSION.

Mr. Marty: I would like to ask Mr. Glover if he believes the feeding of silage has any influence on such cheese as Swiss cheese, when manufactured from silage fed milk?

Mr. Glover: You have asked me a question that I cannot answer with satisfaction to myself. I know of no experiments that have been conducted to determine whether silage has any effect upon cheese or not; but when I was connected with the Minnesota Experiment station I made sweet curd cheese from milk from silage fed cows and I had no trouble with the cheese huffing. I made Edam, Brick and a limited amount of Limburger but I never made any Swiss cheese from silage made milk, but I do know that some of the best milk that has ever been produced in this country, milk that has been selected as being the best, has been made by men who fed their cows silage three hundred and sixty-five days in the year if conditions required it. The milk that was shipped from H. B. Gurler's farm to Paris was eighteen days in transit and three days in Paris before it was sour to the taste, and it was made from silage. However if a farmer is careless and does not properly ventilate his barn, if he permits silage to be strewn around in the alley and allows some to fall in the milk, I can see that the silage would have a tendency to have an injurious effect upon the milk for Swiss cheese, but in the Cheddar cheese factories, where they develop lactic acid, they would have no trouble whatever from silage. They are making thousands of pounds of condensed milk now in this country from silage made milk. Only this fall I was down at St. Louis and out to Greenville, where there is a big condensed milk factory, and I was lecturing on feeding in particular and they said "Glover, urge them to build silos. We can make condensed milk from silage made milk if the farmer will but take the necessary precaution of keeping the alley clean and feeding the silage in the proper manner."

Mr. Marty: I would like to say that I have had the opportunity of seeing some experiments carried on where they manufacture Swiss cheese. About two-thirds of the milk furnished to one factory was furnished by the herd of one of the officers of that factory and he fed his cows silage. When the cheese maker called his attention to the fact that his silage made milk was not making good cheese, he insisted that his barn was kept perfectly clean and the fault was not with his silage, and it took about three weeks before it got to the point where it began to show the result of manufacturing cheese from silage made milk. Whether this man employed the best method in feeding I do not know but when he stopped feeding silage the trouble was all over with; he tried feeding silage again, experimented for about three weeks and finally came to the conclusion that it was best for him not to feed the silage.

Mr. Glover: I would say, in reply to Mr. Marty's statement, that there is hardly a feed, unless it be bran, that cannot be fed so it will more or less injure the milk. You feed a cow a combination of timothy hay, rye and corn and silage, if you please, feed them freely and I dare say you will have your cows in rather poor condition and not producing good wholesome milk. I have seen that tried. One of the patrons I visited in my work in Illinois was feeding that same ration I just told you of and he could not feed his baby the milk he produced. That combination is bad. You feed a cow too much oil meal and you will get a certain flavor in your milk; you let a cow graze on rich, new grass and you will get a flavor. I saw a time when I could not make Edam cheese when cows were grazing on rye feed. If you feed cows too much clover you cannot make good cheese, you will more or less injure the milk. I know of one creamery that had to forbid their patrons feeding certain feeds because they fed too much of them. It is feeding right that we are talking about and we must stick to that. Whether silage fed right to dairy cows will affect the milk so as to have a bad effect on Swiss cheese I do not know, but my judgment is if fed properly you can make good Swiss cheese from it.

Mr. Dassow: One of my neighboring cheese factories has had trouble with silage milk, and the man owning the silage fed cows divided them into two lots, feeding one-half with silage and the other not having any, and there was a difference in the silage made milk. What was the matter with that silage?

Mr. Glover: I do not know.

Mr. Aderhold: Did he feed silage before the cows were turned out and did that injure the milk?

Mr. Dassow: Yes, but his neighbor fed silage almost at the same time and his milk was good. The first man's silo was almost empty.

Mr. Glover: Perhaps the silage was mouldy. You can put up silage so it becomes very sour, put it up before it is mature enough.

Mr. Dassow: We have had some experience with silos in my neighborhood. My father fed a herd entirely on silage one spring and I made the milk into cheese and had no trouble with it.

Mr. J. G. Moore: I think Mr. Chas. L. Hill furnishes cream from his farm to one of the best hotels in Milwaukee and he feeds ensilage to his cows. Last winter, when we were getting ready for the Dairymen's convention, in judging milk for that, the inspector of the dairy and food commission judged silage milk as perfect where it was properly fed, not knowing where the milk came from or how it was produced.

The President: Are there any other questions? If not, that ends the program for this afternoon and we will now take up the report of committees. There is only one committee to report and that is the committee on resolutions. I will call on the chairman of that committee to report.

REPORT OF RESOLUTION COMMITTEE.

E. L. Aderhold, Neenah, Wis.
Chairman.

Whereas, This Sixteenth Annual Convention of the Wisconson Cheese Makers' Association through the good efforts of its officers and of other persons, and because of the exceptionally excellent program which had been prepared by our Secretary, Mr. Baer, has been a success in the attainment of our purpose,

Therefore, Resolved, That our thanks are hereby tendered collectively to all of those whose efforts have contributed to this success.

Resolved, That the thanks of this association is due the citizens of Milwaukee who through the Citizens Business League and their honorable mayor have contributed materially to the success and entertainment of this convention.

Resolved, That this association is deeply grateful to and hereby tenders its thanks to the Hon. S. A. Cook, of Neenah, to Chas. Becker of the Wisconsin Coal Co., Milwaukee, to J. B. Ford & Co., manufacturers of Wyandotte Washing Powder, to the Marschall Dairy Laboratory, Madison, and F. A. Averbeck & Co., Jewelers of Madison for the handsome and valuable presents offered the participators in the scoring contests.

Whereas, The Supreme ruler of the universe has seen fit to remove from our midst a man who, inspired by the spirit of progress, had labored long and faithfully to fit himself as an educator in dairying, and who later, through his untiring zeal, became recognized as a force in the uplifting in the dairy industry, therefore,

Resolved, That in the death of our Professor John W. Decker the dairy industry has lost a champion and promoter and the country at large has lost the services of a most useful man.

Be it further resolved, That we extend to his widow and to his parents our sincere sympathy in their bereavement and hereby direct that copies of these resolutions be sent to the said relatives and also be spread on our records.

Resolved, That our thanks are hereby tendered to the Kilburn Male Quartette, to Mrs. Kempfer, and others, for the beautiful songs rendered at our sessions.

Resolved, That Chas. Becker is entitled to special thanks for his instrumentality in furnishing entertainment for our members.

Resolved, That the thanks of this association are due and are hereby tendered the supply men and the transportation men for their moral and substantial support in the past and present.

WHEREAS, It has been known that certain cheese factory operators are evading the spirit if not the letter of the skim cheese law, by shipping skim milk curd out of the state where it is pressed into cheese and sold in competition with our full cream cheese, therefore,

Resolved, That we, the Wisconsin Cheese Makers' Association condemn such practice, for we consider it a serious menace to the welfare of the cheese industry of Wisconsin, and be it further,

Resolved, That the officers of this association be hereby instructed to consider ways and means to abolish said practice.

Resolved, That should the officers of the National Dairy Show Association deem it propitious to hold a National Dairy Show at Milwaukee in 1909, that we hereby pledge our moral support and co-operation in furthering such movement.

Resolved, That the monthly scoring exhibitions as carried on by our State College of Agriculture have proven an unqualified success and are, indeed, an important factor as an educational feature.

WHEREAS, On account of our laws enacted for the regulation of dairy stable sanitation the question of improving stables is a very live one, and

WHEREAS, The majority of cow keepers are not sufficiently posted on stable matters, and are therefore unable, properly, to make the necessary improvements, and

WHEREAS, No means are at hand for supplying in a general way the necessary information, therefore,

Resolved, That we petition the management of our State Agricultural College to issue a bulletin giving concrete illustrations and descriptions of the better class of cow stalls, stable floors and stable sanitation in general. Be it further

Resolved, That copies of this resolution be sent to Dean H. L. Russell, Prof. Henry, and Ex-Governor Hoard.

WHEREAS, The dairy industry has become of such great importance and its effects on general agriculture is so great, therefore, be it

Resolved, That it is the sense of this convention that the dairy division of the United States Department of Agriculture be made an independent bureau. Be it further

Resolved, That certified copies of this resolution be sent to the United States Senate and members of Congress from this state asking that they use their influence to bring about this change at the present session of Congress.

WHEREAS, State inspection and regulation of our dairies and dairy stables is an exceedingly important and necessary function of our state Dairy and Food Commission, and

WHEREAS, Aside from their other duties it is clearly impossible for the present force of inspectors to inspect and enforce sanitation on our one hundred thousand dairy farms.

Therefore, resolved, That it is the sense of this association that the force of the Dairy & Food Commission should be materially increased.

WHEREAS, Professor Hart, of our State Experiment Station has invented a simple and inexpensive method of testing milk for its casein contents, and

WHEREAS, Said invention promises to be a very valuable factor in the promotion of the dairy business in general, and,

WHEREAS, In this invention the State of Wisconsin has through its Experiment Station been again brought prominently before the world as a leader in dairy thought.

Therefore, be it resolved, That our thanks are due and hereby tendered to Prof. Hart for his casein test.

WHEREAS, The question of cream rates has a decided bearing on the future prosperity of the cheese industry and whereas this question is to be argued before the Interstate Commerce Commission at Washington, and whereas, the Wisconsin Dairy Manufacturers' & Milk Producers' Protective Association has been organized for the express purpose of representing the dairy interests of Wisconsin in this and other matters affecting their prosperity and have employed counsel to properly present Wisconsin claims in the case now pending, and feeling that the cheese makers are rightly interested in this matter, therefore be it

Resolved, That we hereby pledge our support to the advancement of this cause.

Respectfully submitted,
E. L. ADERHOLD, *Chairman,*
Neenah, Wis.
J. W. MOORE,
Madison, Wis.
P. H. KASPER,
Welcome, Wis.

On motion, duly seconded, the resolutions were adopted as read.

Mr. Carswell: I wish to offer a resolution that was unanimously adopted at the Executive Committee meeting this afternoon at 1 o'clock.

WHEREAS, A number of cheese buyers have cheese entered for which premiums have been awarded and said buyers had the premiums and prizes awarded to them, be it Resolved, That it is the sense of this association that the prizes should only be awarded to the bona fide makers, and the names of such makers be furnished with each entry, the cheese factory operator under whose manufacture the prize winning cheese has been made and entered, shall receive diploma,—or certificate. Be it further Resolved, That any cheese which takes prizes is not entitled to any part of the pro-rata premium fund.

WHEREAS, Prizes and premiums have been awarded on the first day of the convention, be it Resolved, That prizes and premiums are to be awarded next year on the third day of the convention.

A motion was offered and duly seconded to adopt the resolutions as read.

Mr. J. G. Moore: I would like to suggest this, that in thinking over this matter it seems to me that no man who secures a first or second prize trophy, through the absence or non-attendance of the man who rightfully ought to have it, can get any satisfaction out of it. It would seem to me a better plan if the association would adopt a rule that the exhibitor must be here in person or else the trophy will be left with the association and not awarded to any one. That would seem to me to be the fairest means of overcoming this difficulty.

Mr. Carswell: I think this was decided by the executive committee and we overlooked putting it in the resolution and I will willingly accept this as an amendment, because that was the sentiment of the officers and directors when we had the meeting.

The resolutions of the executive committee were adopted as read and on motion, duly seconded, Mr. Moore's amendment was adopted.

Mr. Aderhold: I want to inquire whether the cheese dealer or cheese factory owner who does not make cheese but ships cheese in here can get any pro rata money if he exhibits? Otherwise, can an exhibitor get pro rata money if he is not a cheese maker? There is no reason why they should not send in their cheese and get a score but I do not think they ought to get any pro rata money.

Mr. Carswell: I think this resolution will cover that. It says "All cheese entered must be entered in the name of the maker." All the dealer can receive is the diploma.

Convention adjourned.